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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

FIRST results of farm fertility trials, initiated and carried through successfully last year throughout the sugar districts from Mossman to Nambour, are described fully in this issue by Dr. Kerr. Mr. Edmund Jarvis continues his useful serial notes on cane pest combat and control. A new contributor, Mr. Morwood, has some notes on the American Foul Brood; while the occurrence of a beetle in the stomach of domestic animals is described by Mr. Roberts, who also contributes a note on the Buffalo Fly. Tuberculosis in pigs and how it affects the farmer's pocket is the subject of a timely article, which will be available later in pamphlet form. Mr. Downey describes methods of weighing pigs on the farm, while Mr. Shelton has a note on castration of pigs. Nutrition in sheep is discussed by Messrs. Brünnich and Winks. Butter-making for home consumption is the subject of another useful article. Some interesting information is given by Mr. McGrath on acidity in milk and cream. The progress of fruitgrowing in North Queensland is reported on by Mr. Freeman; and Mr. Barnes has something to say on unproductive citrus trees, followed by an account of fertilizer trials at Elimbah. Regular Journal features are well supplied, and the March issue is sure to meet with a ready welcome from our readers.

Treatment of Smutted Barley.

THE use of smutted barley is not recommended for seed. If it is necessary to use barley showing its presence, smut should be floated and skimmed off after pouring the grain into a vessel containing an ordinary brine solution. Conditions which obtained during the winter and spring of 1930 were favourable for the growths of many kinds of fungus which affect grain, and barley, in common with other winter-growing cereals, suffered in consequence. The Barley Board states that the proportion of smutted grain received generally from growers is unduly high; so badly infected are some of the consignments that, without prior treatment, they are

unsuited even for gristing. In order to correct this state of affairs, and enable growers to produce a food fit for both human and animal consumption, all barley intended for seed should be subjected to treatment by some form of fungicide. That recommended is known as the formalin method, and involves the soaking of all seed barley in a solution consisting of 1 pint of formalin to 60 gallons of water for a period of ten minutes. *Measure the quantities accurately.* The sacks of seed barley should, for convenience in handling, be not more than one-third full, and be securely fastened at the neck. The bags are then totally immersed in the solution and the grain moved freely in the bag whilst in the solution. After ten minutes' immersion each bag is lifted out, and the surplus moisture allowed to drain back into the trough; the grain is then spread out thinly on the ground or floor to dry. If the dipping is done overnight, the seed will be dry enough to sow the next day. It should be remembered that, if it is desired when the seed is dried sufficiently to change it into other bags, the bags so used must also have been treated by the solution to prevent any risk of reinfection.

The Indian Horse Trade.

THE Minister for Agriculture and Stock (Mr. H. F. Walker) has had under consideration the possibilities of a revival of the export trade in horses from Queensland to India. The diversion of this trade to other countries is a matter of concern not only to horse breeders but to farmers in this State, and in furtherance of his desire to secure the support and co-operation of interested parties in this matter, Mr. Walker has convened a conference of representative horse breeders, to be held in Mackay on the twenty-sixth of this month. Invitations have been extended to breeders and owners, and the attendance of all persons who are interested in the proposal to revive this industry would be welcomed.

Veterinary Science—Its Value to Australia.

IN the course of his delivery of the first Kendall oration at Canberra's Institute of Anatomy, Dr. W. R. Robertson (Director of Veterinary Hygiene) said it could not be too strongly emphasised that veterinary science provided one of the first lines of defence in the maintenance of human health. Dr. William Tyson Kendall, shortly after his arrival in Melbourne in 1879, recognised the importance of the live stock industry to Australia, and formed a veterinary association from the few members of the profession then available. In 1888 the veterinary college was formally opened in Brunswick street, Fitzroy, with six students, and in 1908 it was transferred to the University. The value of veterinary science and the necessity of having a competent staff in every State had then become fully recognised. Dr. Kendall's life was given to the education of veterinary surgeons and an endeavour to impress upon the Governments and stockowners generally the dangers of allowing diseases to be introduced to a clean country. In a normal year the value of production from the pastoral and dairy industry in the Commonwealth is approximately £150,000,000. From those figures it will be realised how dangerous would be a spread of live stock diseases. Rinderpest, which gained access to Western Australia in 1923, would have ruined the Australian pastoral industry had it become firmly established. Immediately the disease was discovered every country in the world closed its ports to Australian animals and animal products, and meat export came to a standstill. The disease was eradicated at a cost of approximately £50,000.

Such is the wastage of animal life in Australia, says Dr. Robertson, that it is costing over £150,000 annually to prevent the spread of cattle tick, while the loss to the industry from depreciation is £500,000 a year. Another £500,000 is lost annually from tuberculosis, without taking into account the loss of human life or suffering, to which a monetary value cannot be given. The latest danger is the buffalo fly. It is estimated that the export value of the beef and dairying industry would be reduced by £1,500,000 a year if the pest extended to the southern areas of Queensland and New South Wales. To Dr. Kendall all honour is due for the long and strenuous fight waged in order to establish the veterinary profession in Australia, and to bring home to Governments and the stock-owning public the knowledge that animal health is vitally important, and that the fostering of it is a special study undertaken in the training of the veterinarian.

The Need of a Forest Conscience.—"The Spirits of the Trees."

AUSTRALIANS are commonly reproached by observant visitors with the charge that they have not, as yet, developed a real forest conscience. Any argument to the contrary is immediately met by an invitation to view the landscape from a railway carriage window between any of our capital cities, without going further afield, where enormous tracts of country have, by indiscriminate ringbarking and otherwise, been denuded ruthlessly of valuable indigenous forests. In the course of a recent public address in Melbourne, the Registrar of the Council of Public Education of Victoria, Mr. R. H. Croll, advanced the interesting theory that many Australian farmers and others have inherited a conscious or sub-conscious hatred for trees from their pioneer ancestors, who when they "invaded" Australia were faced with vast armies of trees. To prepare the ground for use they had to attack this enemy with a ruthlessness born of necessity, and now, when such measures are not only unnecessary, but extremely harmful to the country, the same pitiless destruction goes on. Farms are seen standing naked, without a stick of timber to clothe them, and valuable forests are wiped out so as to provide relatively worthless paddocks. Mr. Croll hinted at a terrible vengeance which "the spirits of the trees" might one day exact from man for his violation of nature's laws. He pointed out that green vegetation is necessary to the composition of the very air we breathe, and to the continuance of our water supplies. Without those two necessities we would swiftly perish in a dry and choking atmosphere. In conclusion, Mr. Croll appealed to the public to look after their forests. Ninety per cent. of forest fires, he said, were caused by the carelessness of man.

TO SUBSCRIBERS.

Farmers are urged to retain their names on our mailing list, for through the Journal they may keep themselves well informed in respect of the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along, it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our register.

A cross placed in the square on the first page of the Journal is an indication that the term of subscription ends with the number so marked, and it is advisable to renew immediately if the retention of names on our mailing list is desired.

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Though back numbers may be supplied, prompt renewals of subscriptions will save the extra cost involved, and in these matters the strictest economy is imperative.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Bureau of Sugar Experiment Stations.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

BY EDMUND JARVIS.

CONTROLLING GRUBS OF CANE BEETLES.

During the beginning of February larvæ of our greyback cockchafer will be in the second and third stage of growth. At this stage of development grubs of the former stage can be easily distinguished by the width of head, which measures a quarter of an inch across transversely, while in those of the third stage the head width is three-eighths of an inch. By the end of this month most grubs will have attained their full size, and entered upon their maximum period of destructiveness. Throughout most of February, however, benefit can be obtained on areas where the cane happens to be still small, by stirring the soil at intervals to break up grub chambers, and so give Pheidole ants a chance to assist the farmer in this connection.

Fighting Plant-Eating Beetle Borer.

Small plant-eating beetles belonging to the genus *Rhyparida* may prove injurious this month to young cane shoots. The small white or creamy-yellow grubs of this pest occur in the soil against the basal portion of the stalks, or in the central core of affected shoots, where by devouring the succulent internal tissue they bring about death of the heart-leaves. The beetles, which in the case of two of our species known to attack cane are small hemispherical insects scarcely exceeding a quarter of an inch in length, are of sluggish habit, and often found resting upon the leaves of blady grass and other plants. If touched they usually fall at once to the ground and play possum.

Suitable remedial measures against this insect consist in—

(1) Cutting out all "dead-hearts";

(2) Collecting the beetles when very numerous by shaking them into shallow pans containing water with a film of kerosene;

(3) Keeping headlands free from blady grass; and

(4) Fumigating badly infested soil with carbon bisulphide.

Growers are asked to advise the Entomologist at Meringa of any material injury to cane thought to be due to the presence of this beetle.

Grass Caterpillars Attacking Cane Stools.

Keep a look-out for the so-called "Leaf-eating Grass Worm" which occasionally strips the leaves of cane and maize plants. This caterpillar is dark-brown with three stripes on the back and one on each side pale-yellow, the first body segment being brownish-black with three white stripes. Its head is reddish-brown, with eyes lighter and indistinctly mottled with yellow, and with a large V-shaped mark on face. Under surface of body light yellowish-green dotted with white or brown on the area between legs and lower sides of body. Length of caterpillar 1 inch. The first serious outbreak of this insect occurred at Meringa during February of 1920, when the larvæ were noticed swarming in countless thousands over an area of about 1,000 acres planted to maize and sugar-cane.

In cases where cane is seriously injured, while the caterpillars are only about half grown it is advisable to spray the leaves with lead arsenate (2 lb. in 50 gallons of water). The swarm of advancing caterpillars can be checked by spraying herbage, &c., lying between them and the crop with a solution consisting of arsenic of soda 1 lb., black sugar 2 lb., water 10 gallons. Fortunately, the insect in question is well controlled naturally by various predaceous and parasitic insect enemies, chief of which is a small tachinid fly. (For additional control methods see Bulletin No. 3, Second Edition (revised), pp. 40-42.)

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the period December to January, 1930-31, from Mr. E. Jarvis, Entomologist, Meringa, near Cairns:—

CONTROL OF OUR LARGE MOTH BORER OF CANE

(*Phragmatiphila truncata* Walk.).

DAMAGE due to this pest is frequently mistaken for that caused by our beetle borer of cane (*Rhabdocnemis obscurus* Boisd.) which, however, is a dark greyish-black weevil of totally different appearance and habits. The following points of distinction should help growers to distinguish between these two species:—

The moth borer in question generally attacks young plant and ratoon shoots from 1 to 2 feet high, its long slender caterpillar being light yellowish in colour suffused at times with purple; whereas, the grub of the beetle borer is creamy white, of somewhat pear-shaped form, and pointed at the tail end. Owing to the habits and protective coloration of this moth, specimens are very rarely to be met with in canefields. When at rest, with wings wrapped closely above the body, it resembles a fragment of dry stick or a dead twisted leaf, and if handled at such times offers no sign of life, remaining quite motionless and making no attempt to escape by flight.

Description of Moth.

A life sketch of this insect with expanded wings is shown at Fig. 1 on accompanying plate.

The front wings are of uniform light yellowish silvery-brown, with a row of tiny black dots on edge of outer border, an oblique irregular row near centre of wing, and a few dots on basal area of same. Hind wings paler, and without spots. Antennæ of female setaceous; those of male with two rows of pectinations. Pronotum tufted with a cushion of long brownish scales, under which the head is usually hidden from view. Wing expanse variable, from 27 to 36 mm. Specimens of these moths may be easily bred from caterpillars cut out of "dead-hearts."

Description of Pupa.

Shining dark reddish-yellow. Abdomen obscurely banded, with ochreaceous head. End of anal segment and dorsum of thorax blackish-red. Dorsal area of first five body segments with numerous transverse striæ, remaining segments with a few striæ, and the anterior portion coarsely punctulate. Hind angle of front wings close to spiracular line broadly rounded, commencing at posterior edge of sixth body segment; tips of wings reaching nearly to posterior edge of fourth abdominal segment. Pronotum roughly striate and punctate. Spiracles narrowly elongate. Extremity of anal segment furnished with two short horn-like hooks (see Figs. 3 and 6). Length 19 to 23 mm., width 5 mm.

Habits of the Caterpillar.

During 1915, when initial investigations were carried out by the writer in connection with the occurrence of this moth borer in canefields around Gordonvale, it was noticed that a single caterpillar will often destroy many shoots in a stool. (See Fig. 10 on plate.) This habit has been observed also in New South Wales, where *P. truncata* is the principal insect pest of sugar-cane, being very destructive to the young plants and to mature cane sticks.

Such desertion of the young shoots first tunnelled by these caterpillars is probably due to decay of the succulent central core—caused by death of the heart-leaves—which sets up fermentation and internal fetid conditions.

When attacking fully-grown canes the caterpillar will often bore into the softer upper portions of a stick, tunnelling in more or less transverse direction, just under the rind below the cane top and sometimes causing death of the central leaves; or will invade the basal end of sticks as shown at Fig. 9 on plate.

If disturbed it invariably seeks the bottom of its tunnel, making no attempt to vacate it until the shoot or cane be sectioned lengthwise, when it drops hastily to the ground; remaining there motionless if hidden from view, or crawling rapidly away if exposed in search of suitable cover. Transformation to the pupal stage often takes place in a tunnel formed by the larva in such position as to provide the future moth with a suitable exit from the cane; or pupation may occur in the

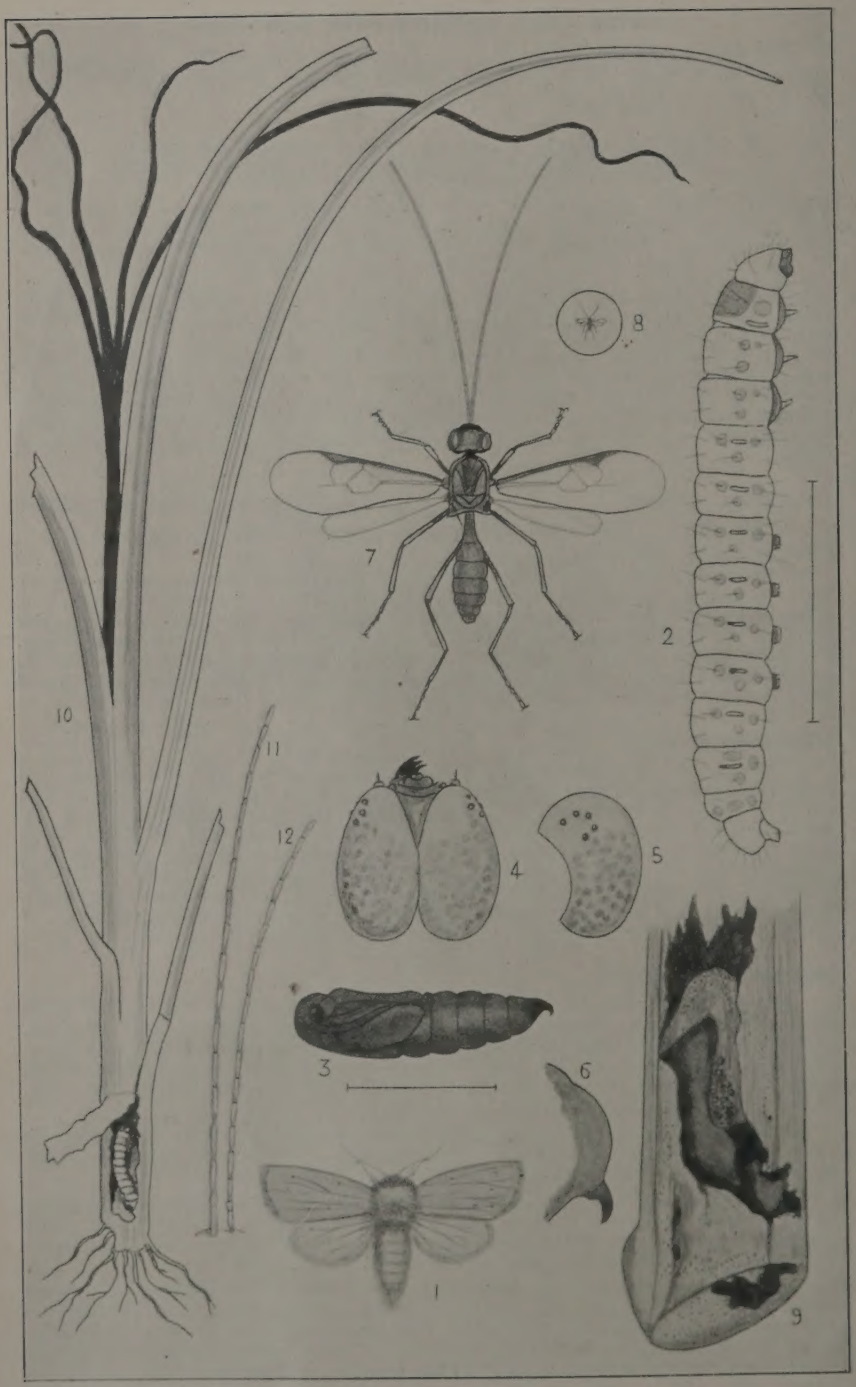

PLATE 55.

(For Description of Plate see page 143.)

centre of young damaged shoots amongst moist excreta, close to the ground against bases of canes, or under dead leaf-sheaths or debris webbed together to afford temporary protection to the pupa.

Description of the Caterpillar.

General colour light purplish or yellowish-pink, paler on ventral area. Sides of body marked with numerous dull brown spots or blotches of variable size and shape. Spiracles large, black, of narrow elongate form. Dorsal surface of first thoracic segment with a coriaceous brownish-yellow plate, the second and third thoracic segments deeply wrinkled. Head castaneous (chestnut colour), median depression well marked, eyes rounded behind, lateral ocelli five in number (Figs. 4 and 5), mandibles blackish, labrum, labium, and maxillæ pinkish. Dorsal area of body-segments 2 to 10 have four black dots, each encircled by a suffused whitish ring; those on thoracic segments being in a transverse line, and on abdominal segments 1 to 8 in two pairs, the anterior closer together than the posterior pair except on segment 8, where they are larger and wider apart anteriorly. Segment 9 has a transverse row of six large smoky blotches close to posterior margin. Ventral area of abdominal segments 1, 2, 7, 8, with a transverse row of six to eight black dots. Anal segment with eight dorsal dull yellow hairs in two transverse rows, and sides of anal claspers surrounded by about the same number, each anal hair being encircled by a tiny black ring. All dots and blotches mark the site of a single short brown hair. Arrangements on each segment of the shining smoky postulate blotches occurring on sides of body are shown in Fig. 2 of plate. Length of caterpillar 25 to 38 mm. (1 to 1½ inch).

Insect Parasites of the Large Moth Borer.

About eleven years ago (November, 1919) while studying the life history of this pest under field conditions, the writer was fortunate enough to breed a braconid parasite from cocoons found in a tunnelled cane shoot, which proved to be *Apanteles nonagriæ* Oliff., an insect previously described by Oliff. in 1893, and which happened to be the chief enemy of *P. truncata* in New South Wales (see Bulletin No. 17, pp. 64, 69, 72). In view of the fact that each of these minute wasp parasites is able to lay nearly 100 eggs (our highest record from specimens bred at Meringa Experiment Station being 93), and, moreover, has a life cycle of only three weeks, it is not surprising that in the Cairns district damage to cane from attacks of this moth borer seldom assume serious proportions. The larval stage of this braconid parasite occupies about fourteen days, after which its maggots leave the body of the infested caterpillar and spin white egg-shaped silken cocoons, which measure about three-sixteenth of an inch in length and are attached together in a mass, either near the empty skin of the host, in some convenient cane tunnel, or behind loosened leaf-sheaths, &c.

LARGE MOTH BORER.

Descriptive notes in connection with illustrations of the "Large Moth Borer" shown in Plate 55, page 142 :—

FIG. 1.—"Large Moth Borer," female, natural size.

FIG. 2.—Diagrammatic sketch of caterpillar of same, showing position of smoky blotches, magnified.

FIG. 3.—Pupa of same, magnified.

FIG. 4.—Head of larva of same, magnified.

FIG. 5.—Side view of head of same, showing lateral ocelli.

FIG. 6.—Side view of extremity of anal segment of pupa of same, showing a terminal hook, magnified.

FIG. 7.—Hymenopterous parasite of same (*Apanteles nonagriæ* Oliff.), highly magnified.

FIG. 8.—*Apanteles nonagriæ* Oliff., natural size.

FIG. 9.—Section of basal portion of cane stick, tunnelled by caterpillar of the "large moth borer."

FIG. 10.—Diagrammatic sketch of shoot with "dead-heart."

FIG. 11.—Sketch of antenna of male wasp (*A. nonagriæ*), showing 18 joints, highly magnified.

FIG. 12.—Sketch of 18-jointed antenna of female parasite (*A. nonagriæ*) of same magnification as Fig. 11.

This useful little wasp, which might easily be mistaken at first sight for a very tiny black fly, is about one-twelfth of an inch long, with reddish legs and two thread-like antennæ of greater length than its body. Details of the wing neuration, ocelli, and other specific characters are shown in the magnified sketch given at Fig. 7.

Another important insect enemy of *P. truncata* is a large tachinid fly, which was first bred by the writer from caterpillars collected near Gordonvale in the year 1915 (see Bulletin No. 3, Second Edition (revised), p. 9). As no description of this parasite has been published, the following brief account of its general appearance, when slightly magnified, will be of interest to sugar entomologists:—

Female.—Body very robust, abdomen noticeably wider than thorax, dull blue-grey obscurely blotched with yellow and clothed with very long black bristles. Head wider than thorax; vertex scarcely width of eye; face whitish-ochraceous, with about thirty-two long bristles on upper portion; median depression whitish with a row of small and three long bristles on each side, the latter being near proboscis. Eyes large, dark, castaneous, hind margin bordered dorsally by a narrow silver band edged posteriorly with small black spines; surface of occiput silvery, densely clothed with white hairs. Antennæ reddish-yellow, second joint about twice length of first, third more than three times length of second, flabellate, clouded distally with dark grey, arista naked, obscure reddish, thickened on basal portion; palpi yellow; proboscis blackish; ocelli pink, situated on dark suffusion. Mesonotum bluish grey, clouded sub-dorsally and on hind margin with dull ochraceous, and marked very obscurely with about twelve longitudinal impressed blackish striæ irregularly distributed in two transverse rows; bristles about thirty-six in number, forming six rows. Scutellum large, dull ochraceous, with four very long curved marginal bristles and a number of much shorter ones. Halteres yellow, squamæ large, white, margined with pale yellow. Wing neuration yellow, shaded into fuscous towards tip; costal nervure edged with tiny spines. Length of wing 7.50 mm., width 3.30 mm.; abdomen ochraceous, grey, pollinose, clouded except on sides of second segment with brownish-blue, and thickly set with short spines; hind edge of third segment with about twelve, and apical area of fourth segment with ten long spines. Legs blue-black, femora with many long spines. Length of body 7.50 mm., width across abdomen 4 mm. Wing expanse 17 mm.

Appearance and Mode of Injury.

The presence of this moth borer in canefields is rendered conspicuous owing to the central leaves of affected plants ultimately dying and turning a yellowish-brown colour, exhibiting what is known as "dead-hearts." (See Fig. 10.) Infestation, however, is usually of local occurrence, the plants attacked being more or less scattered, while the entire area affected seldom exceeds much more than an acre. The percentage of loss amongst young ratoon shoots is generally greater, as might be expected, close to headlands than near the centre of a block of cane; indicating that such difference has arisen from an invasion of moths breeding in native food-plants growing outside the cultivation. From field observations made by the writer a single egg is attached to the base of a cane shoot in some secluded position close to the ground. In all probability four broods of this moth occur annually, the one appearing in the spring (September to November) when most of the cane is small, generally doing most damage to young plant and ratoon crops.

Remedial Methods.

At the present time we may reasonably assume that our large moth borer is mainly controlled by the two abovementioned parasites, although quite possibly additional hymenopterous enemies may be found later on to play a part in its biological control. In many canefields around Cairns, Babinda, and other districts a small Pheidole ant affords very material assistance in thinning the ranks of this borer by entering the tunnels in affected shoots and killing the caterpillars.

The artificial control method adopted in most cases of infestation consists in cutting out all shoots showing "dead-hearts"; taking care to sever them at a point about 2½ inches below ground level, in order to ensure getting below the caterpillar. These should be crushed to destroy the enclosed caterpillars or pupæ.

On certain farms at Rita Island in the Burdekin district the larvæ of this moth are credited with effecting considerable damage at times to young cane shoots when only a few inches high. Some of the farmers there assert they have found caterpillars of *P. truncata* breeding outside cane land in a large kind of grass. While such belief is quite feasible and probably correct, no native food-plants have, to my knowledge, been definitely determined or recorded for this species up to the present.

FARM FERTILITY TRIALS.

RESULTS FOR THE 1930 SEASON.

Compiled by H. W. KERR, Agriculturist.

During the past milling season the first series of farm fertility trials was harvested. In all twenty-nine experiments were carried through successfully; these were distributed throughout the cane areas from Mossman to Nambour. The returns from these experiments provide us with some very useful information, and our results must be regarded as quite satisfactory. With the progress of time many of the minor defects from which the earlier trials have suffered will be eliminated, and the quality of the results should be improved as a consequence.

EXPERIMENTAL METHOD.

THE general type of layout for these experiments was a series of twenty-five small plots of equal size varying in area from one-fifteenth to one-twenty-fifth acre depending on expected crop, harvesting method, area of block on which the trial was located, and so on. These plots were set out in five rows of five plots, giving us five plots of each of five treatments. In this way the question of soil variation from point to point in the field could be overcome to a large extent, by scattering the five plots of each treatment at random throughout the block. To make the matter clear we give below a plan of a typical experimental layout:—

NP	C	NPK	N	NK
NPK	N	NP	NK	C
C	NK	N	NP	NPK
NK	NP	C	NPK	N
N	NPK	NK	C	NP

At harvesting, the cane from each plot was taken on one mill truck, and individual weights obtained. As far as possible, individual c.c.s. tests were also secured from the mill samples. In calculating the results from the different treatments, the average weight of cane from each set of five plots was taken as a measure of the true yields for that treatment under the local conditions of soil, climate, and cultivation methods.

Fertilisers Employed.

No commercial mixtures were used in setting out any of the trials. All treatments were based on the use of the three "primary" constituents of a mineral nature which are commonly used in the manufacture of commercial mixed manures, namely:—

(1) Sulphate of ammonia, which supplies 20 per cent. of nitrogen in a water-soluble form.

(2) Superphosphate, which contains 22 per cent. of phosphoric acid in the water-soluble condition.

(3) Muriate of potash, supplying 50 per cent. of water-soluble potash.

Our first series of five plots acted as a control on the manurial treatments, and these received no fertiliser. They are designated in the plan by "C." Another set of five received a fixed amount of sulphate of ammonia as the only fertilising constituent; these plots are marked "N." A further series received superphosphate in addition to the above quantity of sulphate of ammonia; these are the "N P" plots. Other five were treated with potash and sulphate of ammonia, and these are labelled "N K." The remaining five plots received a complete fertiliser—sulphate of ammonia, superphosphate, and muriate of potash; these are represented by "N P K" on the plan.

In each treatment, the letters represent the same weights of fertiliser per acre whenever they appear, thus for a typical example:—

"N" represents 240 lb. sulphate of ammonia,

"P" represents 300 lb. superphosphate,

"K" represents 180 lb. muriate of potash.

It will be evident, then, that by comparing the five average yields after harvesting, the value of the additional constituents over the simple treatments may readily be gauged.

In selecting the above constituents for use in these trials, the question of simplicity was the chief consideration. Further, by selecting water-soluble fertiliser, quick response was sought. Muriate of potash was taken in preference to the sulphate, because of the purchase price consideration. The former is the cheaper per unit of potash, and our experiments to date with these two forms of potash indicate that they are essentially equally efficient as sources of potash for cane growing.

Combination of Fertiliser and Liming Trial.

In a few selected localities, it was found convenient to test the need for lime, in addition to the five treatments enumerated above. With these trials thirty plots were selected, in six sets of five. Thus, there were six plots of each fertiliser treatment and, in addition, three of these were limed whilst three were left unlimed. It will be appreciated that such an experiment yields considerably more information than the simple type without lime, but the question of the lime and fertiliser application and the increase in the number of plots required, make the laying-out and harvesting of the experiment much more laborious.

Method of Application of Fertiliser.

Research work in other countries has shown that the earlier the fertiliser is applied to the crop, the greater is the response to the treatment. Our own experiments have shown identical results. Consequently, in these farm trials, all potash and superphosphate was applied in the drill before the plants were dropped. With the sulphate of ammonia the case is somewhat different. Water-soluble nitrogenous fertilisers are likely to do damage to young roots and shoots under certain conditions. Further, under conditions of heavy rainfall, the valuable nitrates may be washed from the soil before the crop can absorb them; this danger does not arise in the case of superphosphate and potash. Hence, only about one-fifth to one-fourth of the ammonia was applied in the drill, while the remainder was given as a top-dressing when the stools were fairly well established. It was generally possible to have the fertilising completed by the end of November.

Many growers will doubtless take exception to this method of applying fertiliser, but we can assure them that we have every reason to believe that it is the best practice. In no case have we observed ill effects from fertiliser applied in this way, and in many instances, particularly where soils are deficient in phosphates, we have observed that any plots receiving superphosphate in the drill have made decidedly better earlier growth than those which received none, and this advantage was maintained throughout the growing period.

Results to Date.

A note of warning should be given in presenting the results of one year's work. It must be carefully observed that these responses to fertiliser are governed by a number of factors, one of which is climate. Under a certain rainfall distribution one fertiliser combination may prove superior, while in another year the returns will be quite different. It should be borne in mind, then, that the results reported herewith cover only one particular season and are to be taken only as indicative of what might be expected. Most of the plots reported will be carried through two ratoon crops in addition to the plant, and in this way we hope to make the data more nearly complete.

On the whole, the past season was not a good one for cane growth: the spring was decidedly dry, and the rainfall distribution during the summer months was not good. Favourable conditions during the autumn months did assist materially, and the late-harvested cane benefited accordingly.

Basis for Calculation of Value of Crop Returns.

As it is not possible at this time to determine the final nett price to be paid for the past season's crop, the declared price of £17 16s. 10d. per ton raw sugar has been taken as the basis for calculation. Fertiliser prices are based on the Brisbane quotations plus freight. An allowance of 10s. per acre has been made for the cost of application of the fertiliser.

NORTHERN DIVISION.

Location.—**Pringle Brothers' farm, Mossman.**

Soil Type.—Recent alluvial soil on the Mossman River.

Variety.—Badila. Age of crop—Fifteen months.

RESULTS.

	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	26·4	30·5	31·7	33·0	32·6
C.C.S. in cane	18·2%	18·0%	17·9%	17·9%	17·7%
Value of crop	£61 16 0	£69 8 0	£71 17 0	£73 19 0	£72 16 0
Less harvesting costs	£10 10 0	£12 4 0	£12 18 0	£13 4 0	£13 1 0
Return	£51 6 0	£57 4 0	£58 19 0	£60 15 0	£59 15 0
Increased return due to fertiliser	..	£5 18 0	£7 13 0	£9 9 0	£8 9 0
Cost of fertiliser and application	..	£2 12 0	£3 16 0	£4 0 0	£5 4 0
Profit from fertiliser	..	£3 6 0	£3 17 0	£5 9 0	£3 5 0

Discussion.—It will be seen that there was a good response to sulphate of ammonia and potash, with but little, if any, from super. The best return was shown from the mixture of sulphate of ammonia and potash—£5 9s. profit per acre. Even the application of 800 lb. of fertiliser per acre, in the complete mixture, showed a profit of 63 per cent. on the money invested for the fertiliser.

Location.—**L. R. Hearn's farm, Mossman.**

Soil Type.—Alluvial soil on the Mossman River. Soil tests showed that the land needed liming.

Variety.—Badila. Age of cane— Fifteen months.

Experimental Plan.—Thirty small plots were set out—fifteen received 1 ton per acre of burnt lime before planting, the remaining fifteen received no lime.

Six plots were given each of the following treatments—three of these had been limed and three left unlimed:—

RESULTS.

	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	26·0	30·6	29·4	30·3	31·9
C.C.S. in cane	17·3%	16·8%	16·4%	16·6%	16·7%

RESULTS FROM LIME.

No lime plots	27·9 tons cane per acre
One ton burnt lime	31·4 tons cane per acre
Increased yield	3·5 tons cane per acre.

Discussion.—The results from this experiment are somewhat erratic, and it is not possible to draw definite conclusions. It is to be hoped that the ratoon crop yields will give more consistent results.

The crop suffered severely for want of moisture in the spring, yet we find a definite increase from sulphate of ammonia and lime. The increase from lime should be of interest to growers in the Mossman area. Probably results from the use of the Mowbray crushed limestone will not be as pronounced as the above on the plant crop following the application; for we know that burnt lime is much quicker in its action than crushed limestone. However, it is probable that the total return over a series of crops will compare very favourably, and the crushed limestone should be the cheaper form of lime in this area.

Location.—**A. J. Kelly's farm, Aloomba.**

Soil Type.—Old alluvial soil of the Mulgrave River; land typical of much of the Aloomba country.

Variety.—B. 147. Age of crop—Thirteen and a-half months.

CROP RESULTS.

	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	28·2	30·8	33·5	31·9	33·7
C.C.S. in cane	14·1%	13·3%	13·5%	13·6%	13·5%
Value of crop	£55 2 0	£56 18 0	£62 15 0	£60 3 0	£63 2 0
Less harvesting costs	£11 5 0	£12 7 0	£13 8 0	£12 15 0	£13 10 0
Return	£43 17 0	£44 11 0	£49 7 0	£47 8 0	£49 12 0
Increased return due to fertiliser	..	£0 14 0	£5 10 0	£3 11 0	£5 15 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£3 15 0	£4 16 0
Profit or loss from fertiliser ..	..	Loss. £1 15 0	Profit. £2 0 0	Loss. £0 4 0	Profit. £0 19 0

Discussion.—The best return in this experiment was from the use of superphosphate. Although sulphate of ammonia gave a crop increase, the reduction in c.c.s. of the cane made the treatment unprofitable. (This crop was harvested early and was probably not mature.) There appears to be a need for only light dressings of potash on land of this type.

Location.—**R. Matthews's farm, Pawngilly.**

Soil Type.—Alluvial soil, typical of much of the Russell River lands. Tests showed the soil to be very acid and in need of a heavy lime dressing.

Variety.—Badila. Age of cane—Twelve and a-half months.

RESULTS.

—	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 400 lb. Super-phosphate	240 lb. Sulphate of Ammonia + 120 lb. Potash.	240 lb. Sulphate of Ammonia + 400 lb. Super-phosphate + 120 lb. Potash.
Tons cane per acre	12·1	12·8	19·2	15·6	20·5
Value of crop	£24 5 0	£25 11 0	£38 6 0	£31 5 0	£41 0 0
Less harvesting costs	£4 17 0	£5 2 0	£7 13 0	£6 5 0	£8 4 0
Return	£19 8 0	£20 9 0	£30 13 0	£25 0 0	£32 16 0
Increased return due to fertiliser	..	£1 1 0	£11 5 0	£5 12 0	£13 8 0
Cost of fertiliser and application	..	£2 1 0	£3 9 0	£2 17 0	£4 5 0
Profit or loss from fertiliser ..	..	Loss. £1 0 0	Profit. £7 16 0	Profit. £2 15 0	Profit. £9 3 0

INCREASED YIELD DUE TO LIME.

No lime	13·0 tons cane per acre.
One and a-half tons burnt lime per acre	18·7 tons cane per acre.
Increase	5·7 tons cane per acre.

Discussion.—The block selected for this experiment was portion of a farm which had been cropped without the use of the correct fertiliser. The land was also very much in need of lime. A thirty-plot trial was set out—fifteen plots received lime before planting and the remaining fifteen were left unlimed.

Series of six plots (three limed and three unlimed) were then submitted to the five fertiliser treatments shown above. The results show that the return from lime and superphosphate has been most marked. This is in conformity with our findings at the South Johnstone Sugar Experiment Station, that very acid soils give best results after the use of lime and superphosphate. The returns may be summarised as follows:—Lime showed an increase of 5¾ tons of cane per acre, and superphosphate (400 lb. per acre) a further 6½ tons.

Location.—**W. Thiele's farm, Pawngilly.**

Soil Type.—The selected block was on the fringe of the red volcanic loam which constitutes a fair area of the elevated cane lands of the Bartle Frere district.

Variety.—Badila. Age of cane—Eighteen months.

CROP RESULTS.

—	No. Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 300 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 300 lb. Potash.
Tons cane per acre	18·2	18·9	18·7	30·0	32·3
C.C.S. in cane	13·7%	13·7%	13·5%	14·9%	14·8%
Value of crop	£28 7 0	£29 11 0	£28 15 0	£53 8 0	£57 1 0
Less harvesting costs	£7 5 0	£7 10 0	£7 9 0	£12 0 0	£12 18 0
Return	£21 2 0	£22 1 0	£21 6 0	£41 8 0	£44 3 0
Increased return due to fertiliser	..	£0 19 0	£0 4 0	£20 6 0	£23 1 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£4 8 0	£5 9 0
Profit or loss from fertiliser	..	Loss. £1 10 0	Loss. £3 6 0	Profit. £15 18 0	Profit. £17 12 0

Discussion.—The outstanding feature of this experiment is the response to potash. The use of this material showed a very large profit, while decided losses were incurred where it was not applied. It should be pointed out that the piece of land carried what are known as "sterile patches" where the cane growth was very poor. It was obvious that wherever potash was applied, the patches ceased to exist.

Remember.—This result applies to the red volcanic loam, and not to alluvial soils; with similar sterile patches under the latter conditions, it is generally found that lime and superphosphate are the corrective materials to apply.

Location.—**J. P. McGowan's farm, Daradgee.**

Soil Type.—The soil was typical of much of the older alluvial soil of the Johnstone River.

Variety.—Badila. Age of crop—Sixteen months.

CROP RESULTS.

—	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate.	240 lb. Sulphate of Ammonia + 160 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 160 lb. Potash.
Tons cane per acre	33·1	33·4	34·8	34·6	35·8
Value of crop	£59 13 0	£60 2 0	£62 14 0	£62 5 0	£64 10 0
Less harvesting costs	£13 6 0	£13 8 0	£13 18 0	£13 16 0	£14 6 0
Return	£46 7 0	£46 14 0	£48 16 0	£48 9 0	£50 4 0
Increased return from fertiliser	..	£0 7 0	£2 9 0	£2 2 0	£3 17 0
Cost of fertiliser and application	..	£2 1 0	£3 6 0	£3 2 0	£4 7 0
Loss from fertiliser	..	£1 14 0	£0 17 0	£1 0 0	£0 10 0

Discussion.—Prior to planting, a leguminous crop which had been fertilised with potash and super. was ploughed under. The above fertilisers were additional, and the results show that under these conditions only small though definite gains in crop yield result. The

leguminous crop had supplied sufficient nitrogen for the plant crop, so that the sulphate of ammonia showed a direct loss. Without this material, the potash and phosphate would probably have shown small profits, and the indications are that a small dressing of these two materials in the drill would have been beneficial.

Location.— **J. A. Wolff's farm, South Johnstone.**

Soil Type.—The red soil of the area which is often confused with the red volcanic loam. It is a soil derived from the decomposition of the schist rock so common in the area.

Variety.—Badila. Age of crop— Fifteen months.

CROP RESULTS.

	No. Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	30·8	29·0	37·7	35·1	37·4
Value of crop	£60 7 0	£56 16 0	£73 18 0	£68 16 0	£73 8 0
Less harvesting costs	£12 6 0	£11 12 0	£15 1 0	£14 0 0	£14 19 0
Return	£48 1 0	£45 4 0	£58 17 0	£54 16 0	£58 9 0
		Decrease.			
Increased return from fertiliser	..	£2 17 0	£10 16 0	£6 15 0	£10 8 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£4 0 0	£5 1 0
		Loss.	Profit.	Profit.	Profit.
Profit or loss from fertiliser	..	£5 6 0	£7 6 0	£2 15 0	£5 7 0

Discussion.—It will be noted that the results are erratic, but there is undoubtedly a good response to potash and superphosphate. The depressed yield due to sulphate of ammonia is, no doubt, fictitious. It is hoped that the returns from the ratoon crop will be more consistent.

Location.—**M. Caldera's farm, Mourilyan.**

Soil Type.—The typical reddish schist soil which forms one of the major soil types of the Mourilyan area.

Variety.—Badila. Age of crop—Seventeen months.

CROP RESULTS.

	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 320 lb. Super-phosphate.	240 lb. Sulphate of Ammonia + 200 lb. Potash.	240 lb. Sulphate of Ammonia + 320 lb. Super-phosphate + 200 lb. Potash.
Tons cane per acre	26·8	30·7	32·7	35·7	37·5
C.C.S. in cane	16·5%	16·6%	16·6%	16·6%	16·7%
Value of crop	£55 6 0	£63 17 0	£68 3 0	£74 7 0	£78 18 0
Less harvesting costs	£10 14 0	£12 5 0	£13 2 0	£14 6 0	£15 0 0
Return	£44 12 0	£51 12 0	£55 1 0	£60 1 0	£63 18 0
Increased return from fertiliser	..	£7 0 0	£10 9 0	£15 9 0	£19 6 0
Cost of fertiliser and application	..	£2 1 0	£3 3 0	£3 7 0	£4 9 0
Profit from fertiliser	..	£4 19 0	£7 6 0	£12 2 0	£14 17 0

Discussion.—The results from fertiliser have been most marked on this block. Sulphate of ammonia and potash have shown large increases.

with a smaller return from superphosphate. The profit from the use of 760 lb. of mixed fertiliser was almost £15 per acre.

Location.—**S. Pagano's farm, Mourilyan.**

Soil Type.—The typical reddish schist soil of the Mourilyan area.

Variety.—Badila. Age of crop—Twelve and a-half months.

CROP RESULTS.

—	No Fertiliser.	320 lb. Sulphate of Ammonia.	320 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	320 lb. Sulphate of Ammonia + 200 lb. Potash.	320 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	26·2	28·1	26·7	29·8	29·2
C.C.S. in cane	16·3%	16·0%	16·1%	15·7%	16·0%

Discussion.—This crop followed a "plough-out and replant." There has been some response to the fertiliser treatment, but the results are erratic, and have not been calculated in detail. The plots have been ratooned and better results are hoped for in succeeding crops.

Location.—**W. Jones's farm, Silkwood.**

Soil Type.—Acid alluvial soil typical of the area. Tests show need for lime and phosphate.

Variety.—Badila. Age of crop—Seventeen months.

CROP RESULTS.

—	No Fertiliser.	360 lb. Sulphate of Ammonia.	360 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	360 lb. Sulphate of Ammonia + 180 lb. Potash.	360 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 180 lb. Potash.
Tons cane per acre	21·2	23·1	31·1	23·4	33·5
Value of crop	£35 1 0	£38 4 0	£51 7 0	£38 12 0	£55 5 0
Less harvesting costs	£8 10 0	£9 5 0	£12 9 0	£9 7 0	£13 8 0
Return	£26 11 0	£28 19 0	£38 18 0	£29 5 0	£41 17 0
Increased return from fertiliser ..	..	£2 8 0	£12 7 0	£2 14 0	£15 6 0
Cost of fertiliser and application	..	£2 17 0	£3 18 0	£4 0 0	£5 1 0
Profit or loss from fertiliser ..	..	Loss. £0 9 0	Profit. £8 9 0	Loss. £1 6 0	Profit. £10 5 0

Discussion.—The land was treated to an application of lime earth before planting. The results show a very decided response to superphosphate, which is in harmony with our findings for acid soils of an alluvial nature.

Location.—**Allison Brothers' farm, Midgenoo, Tully.**

Soil Type.—A light buff alluvial soil with tendency towards poor drainage in local areas—typical of a fair area of land in this district.

Variety.—Badila. Age of crop—Fourteen and a-half months.

CROP RESULTS.

	No Fertiliser.	240 lb. Sulphate of Ammonia.	240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate.	240 lb. Sulphate of Ammonia + 150 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 150 lb. Potash.
Tons cane per acre	19·1	19·7	29·2	21·4	29·1
Value of crop	£34 8 0	£35 7 0	£52 11 0	£38 9 0	£52 8 0
Less harvesting costs	£7 13 0	£7 17 0	£11 14 0	£8 11 0	£11 13 0
Return	£26 15 0	£27 10 0	£40 17 0	£29 18 0	£40 15 0
Increased return from fertiliser	..	£0 15 0	£14 2 0	£3 3 0	£14 0 0
Cost of fertiliser and application	..	£2 1 0	£3 6 0	£3 1 0	£4 6 0
Profit or loss from fertiliser	..	Loss. £1 6 0	Profit. £10 16 0	Profit. £0 2 0	Profit. £9 14 0

Discussion.—One-half of the plots of this experiment received lime earth before planting, the remainder received no lime. The results from liming showed:—

No lime	22·8 tons cane per acre.
Lime earth	24·5 tons cane per acre.
Increase	1·7 tons cane per acre.

The small increase from lime is in keeping with what is generally found to be the case. The plant crop shows a smaller increase than is the case where burnt lime is used, but larger returns can be expected from the ratoon crops.

Again the marked response to phosphate on the acid alluvial soils is noted, and a highly profitable return resulted.

Location.—**S. J. French's farm, Midgenoo, Tully.**

Soil Type.—The typical gravelly loam of the area.

Variety.—Badila. Age of crop—Eleven months (first ratoon).

CROP RETURNS.

	No. Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 120 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 120 lb. Potash.
Tons cane per acre	28·2	31·6	32·5	31·7	32·8
C.C.S. in cane	15·3%	15·1%	14·9%	15·2%	15·1%
Value of crop	£52 6 0	£57 19 0	£58 10 0	£58 9 0	£59 17 0
Less harvesting costs	£11 5 0	£12 12 0	£13 0 0	£12 13 0	£13 2 0
Return	£41 1 0	£45 7 0	£45 10 0	£45 16 0	£46 15 0
Increased return due to fertiliser	..	£4 6 0	£4 9 0	£4 15 0	£5 14 0
Cost of fertiliser and application	..	£2 9 0	£3 10 0	£3 5 0	£4 6 0
Profit from fertiliser	..	£1 17 0	£0 19 0	£1 10 0	£1 8 0

Discussion.—This was a first ratoon crop, and greater response was expected. The return from sulphate of ammonia is appreciable, but potash and super. show only slight gains. It is apparent that these gravelly soils still carry a fair supply of available plant foods.

CENTRAL DIVISION.

Location.—**J. Trevaskis's farm, Farleigh.**

Soil Type.—Sandy loam on gentle slope—similar to a fair area of land in the near neighbourhood.

Variety.—M. 1900. Age of crop—Eighteen months.

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	15·2	16·0	17·9	18·2	21·2
C.C.S. in cane	18·0%	17·9%	18·2%	18·0%	18·1%
Value of crop	£35 1 0	£36 8 0	£41 15 0	£41 19 0	£49 0 0
Less harvesting costs	£6 2 0	£6 8 0	£7 3 0	£7 6 0	£8 9 0
Return	£28 19 0	£30 0 0	£34 12 0	£34 13 0	£40 11 0
Increased return due to fertiliser	..	£1 1 0	£5 13 0	£5 14 0	£11 12 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit or loss from fertiliser ..	..	Loss. £1 7 0	Profit. £2 5 0	Profit. £1 15 0	Profit. £6 14 0

Discussion.—The results indicate that land of this type requires heavy dressings of a balanced mixture. The heaviest dressing (840 lb. per acre) showed a profit of £6 14s. per acre. The apparently poor response to sulphate of ammonia alone is probably due to the deficiency of phosphate and potash, so that the nitrogenous fertiliser alone showed a loss.

Location.—**H. Single's farm, Foulden, Mackay.**

Soil Type.—Recent alluvial sandy loam of good natural fertility, as found along the banks of the Pioneer River.

Variety.—Q. 813. Age of crop—Eighteen months.

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	31·5	34·6	33·7	36·4	35·9
C.C.S. in cane	17·2%	16·6%	16·8%	16·6%	16·7%
Value of crop	£68 2 0	£71 16 0	£70 18 0	£75 11 0	£74 19 0
Less harvesting costs	£12 12 0	£13 17 0	£13 10 0	£14 11 0	£14 7 0
Return	£55 10 0	£57 19 0	£57 8 0	£61 0 0	£60 12 0
Increased return due to fertiliser	..	£2 9 0	£1 18 0	£5 10 0	£5 2 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit or loss from fertiliser ..	..	Profit. £0 1 0	Loss. £1 10 0	Profit. £1 11 0	Profit. £0 4 0

Discussion.—The results from the experiment were somewhat erratic, and definite conclusions cannot be drawn. There does appear to

be a definite response to fertiliser, but apparently the heavy dressings were excessive on this type of soil.

Location.—**C. Rowe's farm, Mirani.**

Soil Type.—The better type of well-drained alluvial loam found along the Pioneer Valley.

Variety.—H.Q. 426. Age of crop—Fourteen months.

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	17·7	21·7	22·7	22·3	24·0
C.C.S. in cane	15·8%	16·0%	15·7%	15·8%	16·1%
Value of crop	£34 12 0	£43 1 0	£44 1 0	£43 11 0	£48 0 0
Less harvesting costs	£7 2 0	£8 13 0	£9 2 0	£8 19 0	£9 12 0
Return	£27 10 0	£34 8 0	£34 19 0	£34 12 0	£38 8 0
Increased return due to fertiliser	..	£6 18 0	£7 9 0	£7 2 0	£10 18 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit from fertiliser	..	£4 10 0	£4 1 0	£3 3 0	£6 0 0

Discussion.—A good response to fertiliser was obtained, and it appears that nitrogenous fertiliser gave the greatest increase. However, 840 lb. of complete mixture showed £6 per acre profit.

Location.—**C. W. Walz's farm, Marian.**

Soil Type.—The soil of this block resembles closely much of the lighter coloured soil of the Mackay area, where natural drainage is only moderately good.

Variety.—M. 1900. Age of crop—Fifteen months.

RESULTS.

——	No Fertiliser.	400 lb. Sulphate of Ammonia.	400 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	400 lb. Sulphate of Ammonia + 240 lb. Potash.	400 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	14·5	17·1	19·4	19·7	20·6
C.C.S. in cane	16·1%	16·5%	16·2%	16·2%	16·2%
Value of crop	£29 0 0	£35 8 0	£39 1 0	£39 13 0	£41 19 0
Less harvesting costs	£5 16 0	£6 17 0	£7 15 0	£7 18 0	£8 5 0
Return	£23 4 0	£28 11 0	£31 6 0	£31 15 0	£33 14 0
Increased return due to fertiliser	..	£5 7 0	£8 2 0	£8 11 0	£10 10 0
Cost of fertiliser and application	..	£3 1 0	£4 0 0	£4 11 0	£5 10 0
Profit from fertiliser	..	£2 6 0	£4 2 0	£4 0 0	£5 0 0

Discussion.—The response to the three fertiliser constituents on this block was fairly even, indicating the need for an evenly balanced mixture. The heaviest dressing (940 lb. per acre) showed a profit of £5 per acre.

Location.—**E. K. Glen's farm, Pleystowe.**

Soil Type.—The soil is typical of the average alluvial soil found in the Pioneer Valley.

Variety.—Q. 813. Age of crop—Thirteen months.

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 180 lb. Potash.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate + 180 lb. Potash.
Tons cane per acre	15·3	17·6	18·5	18·5	19·1
C.C.S. in cane	15·8%	15·7%	15·9%	15·7%	15·7%
Value of crop	£29 19 0	£34 3 0	£36 11 0	£35 18 0	£37 2 0
Less harvesting costs	£6 2 0	£7 1 0	£7 8 0	£7 8 0	£7 13 0
Return	£23 17 0	£27 2 0	£29 3 0	£28 10 0	£29 9 0
Increased return due to fertiliser	..	£3 5 0	£5 6 0	£4 13 0	£5 12 0
Cost of fertiliser and application	..	£2 8 0	£3 4 0	£3 11 0	£4 7 0
Profit from fertiliser	..	£0 17 0	£2 2 0	£1 2 0	£1 5 0

Discussion.—This farm was unfortunate in missing the spring storms which favoured other parts of the district, and the returns are what one might expect from a dry season. However, the return from fertiliser, though small, has been profitable.

Location.—**J. Gibson's farm, Racecourse.**

Soil Type.—The soil was typical of the older soils of the valley, requiring provision for artificial drainage in the wet season.

Variety.—H.Q. 426. Age of crop—Seventeen months.

RESULTS.

——	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 240 lb. Potash.	300 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	22·5	24·8	26·4	25·9	24·0
C.C.S. in cane	17·1%	17·6%	17·6%	17·4%	17·5%
Value of crop	£47 15 0	£54 11 0	£57 19 0	£56 1 0	£52 14 0
Less harvesting costs	£9 0 0	£9 19 0	£10 11 0	£10 7 0	£9 12 0
Return	£38 15 0	£44 12 0	£47 8 0	£45 14 0	£43 2 0
Increased return due to fertiliser	..	£5 17 0	£8 13 0	£6 19 0	£4 7 0
Cost of fertiliser and application	..	£2 8 0	£3 8 0	£3 19 0	£4 18 0
Profit or loss from fertiliser ..	..	Profit. £3 9 0	Profit. £5 5 0	Profit. £3 0 0	Loss. £0 11 0

Discussion.—Unfortunately these results are erratic, probably due to an adverse condition affecting two of the plots of the complete fertiliser. It would appear, however, that definite response to the treatments has been obtained.

Location.—**H. R. Swanson's farm, Homebush.**

Soil Type.—Soil typical of the sandy loam of the Homebush area, responding to artificial drainage by planting in beds.

Variety.—Q. 813. Age of crop—Fifteen months.

RESULTS.

—	No. Fertiliser.	228 lb. Sulphate of Ammonia.	228 lb. Sulphate of Ammonia + 228 lb. Super-phosphate.	228 lb. Sulphate of Ammonia + 136 lb. Potash.	228 lb. Sulphate of Ammonia + 228 lb. Super-phosphate + 136 lb. Potash.
Tons cane per acre	21·8	24·5	26·4	25·3	28·2
C.C.S. in cane	17·3%	17·2%	17·2%	17·3%	17·1%
Value of crop	£47 8 0	£53 0 0	£57 2 0	£55 1 0	£60 13 0
Less harvesting costs	£8 14 0	£9 16 0	£10 11 0	£10 2 0	£11 6 0
Return	£38 14 0	£43 4 0	£46 11 0	£44 19 0	£49 7 0
Increased return due to fertiliser	..	£4 10 0	£7 17 0	£6 5 0	£10 13 0
Cost of fertiliser and application	..	£1 19 0	£2 14 0	£2 16 0	£3 11 0
Profit from fertiliser	..	£2 11 0	£5 3 0	£3 9 0	£7 2 0

Discussion.—Very good response was obtained on this block. This area was favoured by an early thunder storm, which emphasises the importance of the spring rain both in crop growth and results from fertilisers.

Location.—**H. Ivers' farm, Rosella.**

Soil Type.—Sandy loam similar to much of the Homebush land. Artificial surface drainage has been provided for on this farm.

Variety.—Q. 813. Age of crop—Thirteen and a-half months.

RESULTS.

—	No Fertiliser.	300 lb. Sulphate of Ammonia.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 180 lb. Potash.	300 lb. Sulphate of Ammonia + 240 lb. Super-phosphate + 180 lb. Potash.
Tons cane per acre	18·7	19·7	25·6	20·9	26·7
C.C.S. in cane	16·7%	16·6%	16·7%	16·7%	16·8%
Value of crop	£39 1 0	£40 18 0	£53 9 0	£43 13 0	£56 4 0
Less harvesting costs	£7 10 0	£7 18 0	£10 5 0	£8 7 0	£10 14 0
Return	£31 11 0	£33 0 0	£43 4 0	£35 6 0	£45 10 0
Increased return due to fertiliser	..	£1 9 0	£11 13 0	£3 15 0	£13 19 0
Cost of fertiliser and application	..	£2 8 0	£3 4 0	£3 11 0	£4 7 0
Profit or loss from fertiliser ..	..	Loss. £0 19 0	Profit. £8 9 0	Profit. £0 4 0	Profit. £9 12 0

Discussion.—The response to phosphates was most marked on this experimental area. The apparent loss from the sulphate of ammonia alone is probably fictitious, due to the fact that in the absence of phosphate, the crop makes but poor use of the nitrogenous manure.

Location.—**P. Petersen's farm, Sarina.**

Soil Type.—Gray sandy loam to clay loam, 14 to 20 inches deep, with general clayey or gravelly clay subsoil.

Variety.—Q. 813. Age of crop—Fifteen months.

RESULTS.

——	No Fertiliser.	320 lb. Sulphate of Ammonia.	320 lb. Sulphate of Ammonia + 240 lb. Super-phosphate.	320 lb. Sulphate of Ammonia + 160 lb. Potash.	320 lb. Sulphate of Ammonia + 240 lb. Super-phosphate + 160 lb. Potash.
Tons cane per acre	20·1	21·8	23·2	30·0	31·1
C.C.S. in cane	16·9%	16·8%	16·8%	17·0%	17·0%
Value of crop	£42 12 0	£45 17 0	£48 16 0	£64 0 0	£66 7 0
Less harvesting costs	£8 1 0	£8 14 0	£9 6 0	£12 0 0	£12 9 0
Return	£34 11 0	£37 3 0	£39 10 0	£52 0 0	£53 18 0
Increased return due to fertiliser	..	£2 12 0	£4 19 0	£17 9 0	£19 7 0
Cost of fertiliser and application	..	£2 11 0	£3 6 0	£3 11 0	£4 6 0
Profit from fertiliser	..	£0 1 0	£1 13 0	£13 18 0	£15 1 0

Discussion.—On this soil, potash was the important limiting factor, an application of 160 lb. of this material (cost about £1) resulted in about 8 tons increase per acre. Here again the nitrogen showed little increase in the absence of potash, but probably was of material importance in effecting the high yield from the complete manure.

Location.—**P. Brooks's farm, Sarina.**

Soil Type.—Heavy loam soil 10 to 15 inches deep, with stiff clayey subsoil.

Variety.—M. 1900. Age of crop—Thirteen months.

RESULTS.

——	No. Fertiliser.	320 lb. Sulphate of Ammonia.	320 lb. Sulphate of Ammonia + 320 lb. Super-phosphate.	320 lb. Sulphate of Ammonia + 160 lb. Potash.	320 lb. Sulphate of Ammonia + 320 lb. Super-phosphate + 160 lb. Potash.
Tons cane per acre	19·1	19·5	32·1	21·2	30·7
C.C.S. in cane	15·6%	15·3%	15·2%	15·1%	15·2%
Value of crop	£36 10 0	£36 8 0	£59 8 0	£38 19 0	£56 16 0
Less harvesting costs	£7 13 0	£7 16 0	£12 17 0	£8 10 0	£12 6 0
Return	£28 17 0	£28 12 0 Decrease.	£46 11 0	£30 9 0	£44 10 0
Increased return due to fertiliser	..	£0 5 0	£17 14 0	£1 12 0	£15 13 0
Cost of fertiliser and application	..	£2 11 0	£3 12 0	£3 11 0	£4 12 0
Profit or loss from fertiliser ..	..	Loss. £2 16 0	Profit. £14 2 0	Loss. £1 19 0	Profit. £11 1 0

Discussion.—Due to some soil variation effect, the complete fertiliser yield was lower than that from the superphosphate and sulphate of ammonia. However, the results indicate clearly the absolute necessity for heavy phosphate dressings on soils of this type. With treatments which excluded phosphate, the loss from fertiliser was very marked—with the application of super. very high gains resulted.

SOUTHERN DIVISION.

Location.—**Burrage Brothers' farm, Maroondan.**

Soil Type.—Black clay typical of the area.

Variety.—M. 1900. Age of crop—Eighteen months.

RESULTS.

—	No Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 300 lb. Super-phosphate.	250 lb. Sulphate of Ammonia + 240 lb. Potash.	250 lb. Sulphate of Ammonia + 300 lb. Super-phosphate + 240 lb. Potash.
Tons cane per acre	15·2	16·0	17·8	15·7	20·0
C.C.S. in cane	16·7%	17·0%	17·0%	16·8%	17·4%
Value of crop	£32 0 0	£34 9 0	£38 7 0	£33 6 0	£44 8 0
Less harvesting costs	£5 6 0	£5 12 0	£6 5 0	£5 10 0	£7 0 0
Return	£26 14 0	£28 17 0	£32 2 0	£27 16 0	£37 8 0
Increased return due to fertiliser	..	£2 3 0	£5 8 0	£1 2 0	£10 14 0
Cost of fertiliser and application	..	£2 1 0	£3 0 0	£3 11 0	£4 10 0
Profit or loss from fertiliser	..	Profit. £0 2 0	Profit. £2 8 0	Loss. £2 9 0	Profit. £6 4 0

Discussion.—Results were erratic; but, as was anticipated, good results have followed from the use of phosphate. The complete fertiliser showed an increase of almost 5 tons per acre over the plots receiving no fertiliser.

Location.—**P. Peterson's farm, Bingera.**

Soil Type.—This block is on the slope below a volcanic ridge, and is mixed volcanic-sandy loam.

Variety.—Black Innis. Age of crop—Eighteen months.

RESULTS.

—	No Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	250 lb. Sulphate of Ammonia + 400 lb. Potash.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 400 lb. Potash.
Tons cane per acre	15·5	16·2	17·1	21·6	22·0
C.C.S. in cane	13·0%	13·1%	13·0%	13·1%	13·2%
Value of crop	£22 10 0	£23 15 0	£24 16 0	£31 14 0	£32 11 0
Less harvesting costs	£5 9 0	£5 13 0	£6 0 0	£7 10 0	£7 15 0
Return	£17 1 0	£18 2 0	£18 16 0	£24 4 0	£24 16 0
Increased return due to fertiliser	..	£1 1 0	£1 15 0	£7 3 0	£7 15 0
Cost of fertiliser and application	..	£2 1 0	£2 17 0	£4 11 0	£5 7 0
Profit or loss from fertiliser	..	Loss. £1 0 0	Loss. £1 2 0	Profit. £2 12 0	Profit. £2 8 0

Discussion.—The response to potash has been quite marked on this trial. The heaviest dressing of fertiliser (900 lb. per acre) showed a profit of £2 8s. per acre. Undoubtedly the amount of potash applied was excessive.

Location.—**Eardley Brothers' farm, North Coast road, via Bundaberg.**

Soil Type.—Forest sandy loam; an important soil type of the area.

Variety.—D. 1135. Age of crop—Fourteen months.

RESULTS.

—	No Fertiliser.	60 lb. Sulphate of Ammonia.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	60 lb. Sulphate of Ammonia + 300 lb. Potash.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 300 lb. Potash.
Tons cane per acre	16·6	16·6	18·8	18·5	23·4
C.C.S. in cane	14·8%	14·7%	14·9%	14·8%	14·7%
Value of crop	£29 0 0	£28 14 0	£33 1 0	£32 6 0	£40 10 0
Less harvesting costs	£5 16 0	£5 16 0	£6 12 0	£6 10 0	£8 4 0
Return	£23 4 0	£22 18 0 Decrease.	£26 9 0	£25 16 0	£32 6 0
Increased return due to fertiliser	..	£0 6 0	£3 5 0	£2 12 0	£9 2 0
Cost of fertiliser and application	..	£0 13 0	£1 9 0	£2 10 0	£3 6 0
Profit or loss from fertiliser ..	..	Loss. £0 19 0	Profit. £1 16 0	Profit. £0 2 0	Profit. £5 16 0

Discussion.—The results from the trial are not definite, but there was certainly a response to fertiliser. Due to a misunderstanding, the second dressing of sulphate of ammonia was not given, so the plots did not receive a full complement of nitrogen.

Location.—**C. N. Dahl's farm, Bundaberg.**

Soil Type.—Woongarra red volcanic loam.

Variety.—D. 1135. Age of crop—Thirteen months.

RESULTS.

—	No Fertiliser.	60 lb. Sulphate of Ammonia.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	60 lb. Sulphate of Ammonia + 400 lb. Potash.	60 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 400 lb. Potash.
Tons cane per acre	20·1	20·7	21·1	20·7	21·0

Discussion.—The fertiliser has apparently shown no result on this trial.

Location.—**A. Adie's farm, Cordalba.**

Soil Type.—Red volcanic loam.

Variety.—D. 1135. Age of crop—Seventeen months.

RESULTS.

—	No Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	250 lb. Sulphate of Ammonia + 400 lb. Potash.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 400 lb. Potash.
Tons cane per acre	23·0	24·0	24·2	24·1	23·8

Discussion.—There appears to have been some inaccuracy in the returns of the individual plots in this trial, and therefore the results allow of no conclusions being drawn.

Location.—**T. Beattie's farm, Mount Bauple.**

Soil Type.—Stony hillside slope soil, characteristic of upland soils of the area.

Variety.—D. 1135. Age of crop—Eighteen months.

RESULTS.

—	No. Fertiliser.	250 lb. Sulphate of Ammonia.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	250 lb. Sulphate of Ammonia + 300 lb. Potash.	250 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 300 lb. Potash.
Tons cane per acre	13·8	16·6	17·5	19·1	18·9
C.C.S. in cane	14·45%	14·3%	14·3%	14·5%	14·3%
Value of crop	£23 5 0	£27 1 0	£29 0 0	£32 6 0	£31 7 0
Less harvesting costs	£4 17 0	£5 16 0	£6 3 0	£6 14 0	£6 12 0
Return	£18 8 0	£21 15 0	£22 17 0	£25 12 0	£24 15 0
Increased return due to fertiliser	..	£3 7 0	£4 9 0	£7 4 0	£6 7 0
Cost of fertiliser and application	..	£2 1 0	£2 17 0	£3 19 0	£4 15 0
Profit from fertiliser	..	£1 6 0	£1 12 0	£3 5 0	£1 12 0

Discussion.—There appears to be a definite response from the use of nitrogen and potash on this type of soil. Conditions were adverse with this trial, and a deluge of rain after planting probably removed some of the fertiliser with the washed soil.

Location.—**F. N. Kirk's farm, Nambour.**

Soil Type.—Alluvial loam of Petrie's Creek; land requires provision for surface drainage. Excessively wet during heavy rains.

Variety.—Q. 813. Age of crop—Fourteen months.

RESULTS.

—	No Fertiliser.	75 lb. Sulphate of Ammonia.	75 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	75 lb. Sulphate of Ammonia + 150 lb. Potash.	75 lb. Sulphate of Ammonia + 250 lb. Super-phosphate + 150 lb. Potash.
Tons cane per acre	17·3	18·7	21·1	20·1	19·3
C.C.S. in cane	11·1%	10·9%	11·8%	11·3%	11·2%

Discussion.—Response to fertiliser appears to have been very slight, and the results are quite erratic. Soil variation is a serious factor here.

THE BUFFALO FLY

(*Lyperosia exigua* de Meijere).

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

THE buffalo fly affords an excellent example of an insect which, whilst unimportant in its native country, has upon introduction into a new land become a pest of serious dimensions. In the East Indies the fly is almost unknown as a harmful parasite of stock, but in Australia it bids fair to rival the cattle tick as a stock pest of outstanding importance. The reason for this may probably lie in the freedom it enjoys in Australia from the attacks of other insects which in the East Indies so parasitise it as to keep it under control. An alternative explanation may be found in a climatic or some other condition present in Australia which is more favourable to its development and rapid increase.

The buffalo fly belongs to the dipterous family Muscidæ, which, besides including the house fly, the bush flies, and blowflies, comprises a number of biting flies, other species of which are the stable fly of cosmopolitan distribution and the infamous tsetse flies of Africa.

The genus *Lyperosia* contains representative species in various parts of the world. *Lyperosia exigua* is known from the East Indies and Australia; *Lyperosia irritans*, the "horn fly" of the United States, was introduced from Europe, and is a serious pest of cattle in the former country. Three further species occur in the Soudan, all very common, but not regarded as very important parasites of native stock. One of these species, *Lyperosia minuta*, has been introduced to the Transvaal and Zanzibar, but in the latter country only is it regarded as a harmful pest of cattle.

Distribution in Australia.

The buffalo fly is thought to have been introduced into Australia with the first herd of buffaloes which landed at Darwin somewhere about 1826. For many years it remained confined to the country in and around Darwin, and, according to Mr. G. F. Hill, who was formerly Government Entomologist in the Northern Territory, it was not until 1911 that it attracted attention as a pest of cattle. At this time it occupied a range of country extending from the Liverpool River on the east to the Daly River on the west and bounded on the south by the Roper River, the coast line, of course, representing the northern limit. During the next fifteen years extensive movements of cattle occurred and the fly rapidly spread, so that at the end of this period its area of distribution, according to Mr. D. Murnane, of the Council for Scientific and Industrial Research, extended from Broome, West Australia, to the Robinson River on the east and to the watershed of the coastal rivers on the south—an area practically four times as large as that occupied in 1911. It first crossed the far north-western border of Queensland in 1928, and is now reported to be spreading eastward. The infested area in Queensland was surveyed by Messrs. J. H. Smith and J. E. Clegg, of this Department, towards the end of 1928. Dr. Legg, of the Stock Experiment Station, Townsville, also visited the infested area earlier in the year and reported the presence of buffalo fly.

Description and Habits.

The buffalo fly is a small, dark-grey, biting fly, a little more than half the size of the ordinary house fly. (See Plate 56.) Primarily a parasite of the buffalo, the insect has turned its attention to other animals, including cattle, horses, and man, for the purpose of obtaining food. Cattle constitute the preferred hosts, and horses and man are said to be attacked only at such times as they are among infested cattle. Unlike other biting flies such as mosquitoes, march flies, and sandflies, which visit the host only at such times as food is required, the buffalo fly remains on the animals night and day, and only when disturbed or for the purpose of laying eggs does it leave the host. When not feeding they rest in groups on the neck, shoulders, and rumps, in this differing from the American horn fly, which chooses the lower parts of the horns. Both male and female feed on blood, and for this purpose they force their way down among the hairs, elevate the wings, and assume an almost erect position. When disturbed the speed of their flight is astonishing, for, although covered by the hairs of the hide, at a switch of the tail or a toss of the head the flies instantly rise in a cloud for some little distance, returning again as quickly and resuming feeding.

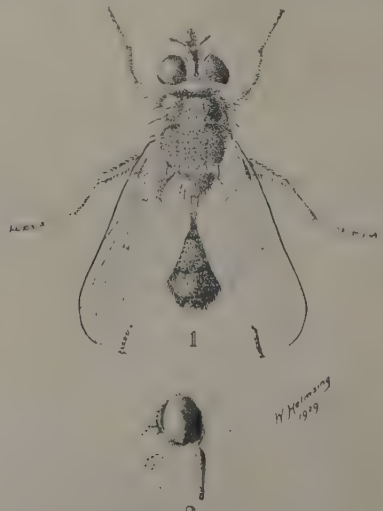

PLATE 56.—THE BUFFALO FLY (*Lyperosia exigua de Meijere*).
FIG. 1.—Adult x 8.
FIG. 2.—Head of Adult, lateral view x 8.

The Egg.

The egg of the buffalo fly is a tiny, elongate, shining brown body, and is deposited by the female fly in the freshly dropped dung of cattle and buffaloes. It was thought that the dung of native animals—kangaroos, wallabies, &c.—and that of horses might prove suitable for the development of the fly, but so far attempts to breed the flies under natural conditions from the dung of these animals have been negative. Unlike bovine faeces, this type of dung is apparently too dry for larval development. As soon as fresh faeces are dropped, the female flies leave

the animal to lay their eggs therein, the egg being deposited either on the surface or else in cracks and crevices. A number of eggs may be deposited in the one spot by a single female, which may lay many such batches in the one season. Under suitable conditions of temperature and moisture the egg may hatch in eighteen to twenty-four hours. Dryness and exposure to sunlight are harmful to the egg, which under such conditions rapidly decomposes.

The Larva.

The larva is a typical fly maggot, small in size and dirty white in colour. On hatching from the egg it immediately burrows into the dung, and keeps on burrowing as the surface layers dry out. Growth occurs fairly rapidly, and in three to five days the maggot is fully grown and ready to pupate.

The Pupa.

When ready to pupate the fully-grown maggot may either remain in the dung or else descend into the soil. The larval skin contracts, hardens, and turns brown. Within this brown, hardened case transformation of the larva to the adult takes place. This stages occupies three to five days, at the end of which the adult fly emerges, dries its wings, and is ready for its parasitic existence.

Duration of Life Cycle.

The complete life cycle occupies seven to eleven days under favourable conditions, the period, of course, being lengthened during the winter months or at any such times as the conditions are adverse to the fly's development.

Seasonal Distribution.

Although the buffalo fly is never quite absent throughout the year, there is a very marked seasonal variation. During the dry winter months the insects are so scarce as to warrant a most careful inspection of individual animals to detect their presence. Commencing with the advent of the rainy season in November they become more numerous, and in the wet months of January and February are at their maximum, gradually becoming less frequent with the approach of May and June.

Economic Importance.

No evidence has yet come to hand that the buffalo fly may be a vector of some deadly disease, but the possibility should always be borne in mind. The cattleman is only too familiar with the worry and irritation cattle suffer through the occasional attacks of mosquitoes, sandflies, and march flies, and with this knowledge the harm that such a parasite as the buffalo fly in its countless numbers and constant attendance may accomplish can well be imagined. Infested animals lose condition fairly rapidly, not only as a result of the blood-sucking habits of the flies, but also through the worry and irritation caused by their presence. When the pest is present in numbers, cattle are kept constantly on the move and feed only at such times as they may gain respite from the fly's attack. As a loss in the milk yield is associated with the presence of the horn fly in the United States, it is reasonable to assume that a similar loss in yield also occurs in the case of the buffalo fly. Moreover, its bite is particularly severe, and the efforts of the beasts to rid themselves of its presence by rubbing the affected parts against posts, tree trunks, &c., causes the formation of large raw areas

which attract other muscid flies—the bush fly and blowflies—which are conducive of further distress. Buffalo fly attack is already producing a noticeable effect on the cattle industry of the North, and should the infestation ever include the dairy and main beef herds of Queensland the loss will become very serious.

Measures for Buffalo Fly Control.

In America horn fly control measures entail killing the larvæ in the dung and also the use of certain fluids to be applied to the cattle which would prevent the fly's attack. Spreading and scattering the dung causes it to dry up and so make it unsuitable for larval development. These methods obviously could not be applied to the buffalo fly under such conditions as are found in the infested areas of the North. The application of repellants has been considered, but such application to every beast on the infested properties would be impracticable if not impossible, as it would entail endless mustering of cattle over many square miles of "wild" country. One other possible line of control remains—control by means of other insects which live on various stages of the fly. In the East Indies the insect is present, but is not known to exist in sufficient numbers to be a pest to local stock. Investigations by officers of the Council for Scientific and Industrial Research have shown that there are at least three parasites of the fly present in these islands which aid in reducing its numbers. These parasites are all tiny wasps of the family Ichneumonidæ. By the introduction to Australia of these and any other parasites which may be found, it is hoped that the buffalo fly may eventually be controlled. Meanwhile, in order to stay the spread of the fly until such time as biological control may play its part, the State authorities have seen fit to create a quarantine area in the far north-western corner of Queensland—an area comprising 6,000 square miles, which was gazetted early in 1929 shortly after the fly had appeared just over the border. Westmoreland crossing, which is the most northern stock route into Queensland, had previously been closed, and all movements of cattle from the quarantine area into the State were forbidden except through the more southern crossings. This means that cattle from the Northern Territory and the quarantine area may enter Queensland only at the Lake Nash and Camooweal crossings. It is believed that the belt of country between the infested area and these crossings forms a natural barrier to the spread of the fly, as the rainfall is too low for the development and increase of the pest.

Acknowledgment.

For much of the information on the life history of the buffalo fly, the writer is indebted to notes published by Mr. G. F. Hill, formerly Government Entomologist, Northern Territory.

A HELPFUL JOURNAL.

Two Toogoolawah farmers, renewing their subscription, write (21*st January*, 1921):—"*. . . . We find the Journal a great help in every way.*"

A Tara farmer writes (27*th January* 1931):—"*As the years go by the Journal continues to improve, reaching a high standard of usefulness.*"

A Charters Towers subscriber writes:—"*It is a publication I would not be without.*"

AMERICAN FOUL BROOD.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

AMERICAN foul brood (see Plate 57) is an infectious disease resulting in the death of bee larvæ when they are fed with honey contaminated with the causal agent. This causal agent is a bacterium of the type which produces spores. These are reproductive bodies which are resistant to ordinary methods of disinfection, but are killed by being boiled for twenty minutes.

Symptoms.

The symptoms of the disease are as follows:—

(1) The colony is weakened. This is only noticed in the later stages of the disease.

(2) A portion of the brood is dead.

(3) The brood is irregularly distributed in the comb.

(4) A number of caps on brood cells are somewhat darker than normal, and may be perforated with one or more small holes, or may be sunken. They are especially liable to be sunken after a brood comb containing disease has been handled several times.

(5) Larvæ in uncapped cells just before they reach the stage for capping may be dead, but most of the dead brood will be found in capped cells.

(6) Larvæ just dead are yellow; they later turn coffee brown. Pupæ dead of the disease are coffee brown.

(7) With a toothpick (or similar article) a dead larva cannot be removed entire, as the decayed skin will break revealing a viscid mass which can be drawn out on the point of the toothpick to form a string one-half inch or more in length.

(8) In the later stages of the disease scales, consisting of dead brood, can be seen lying flat along the two lower sides of the cell. These are the remains of larvæ which have died before being capped and of larvæ and pupæ which have died in capped cells from which the caps have been subsequently removed by bees.

(9) There is an odour which resembles poor quality glue noticeable when a severely diseased hive is opened. This cannot be detected when only a few cells are affected on a comb some time after its removal from a hive.

European foul brood differs in that death of the brood occurs in uncapped cells more than in capped cells. The dead larvæ occur in unnaturally twisted positions. The scales formed in the later stages of the disease are less brittle. A foul odour may or may not be present. The contents of the dead larvæ are less viscid than in American foul brood.

Sacbrood differs in that the contents of the dead brood are watery, and that with care the dead brood can be removed intact. There is no odour, and no scales are formed.

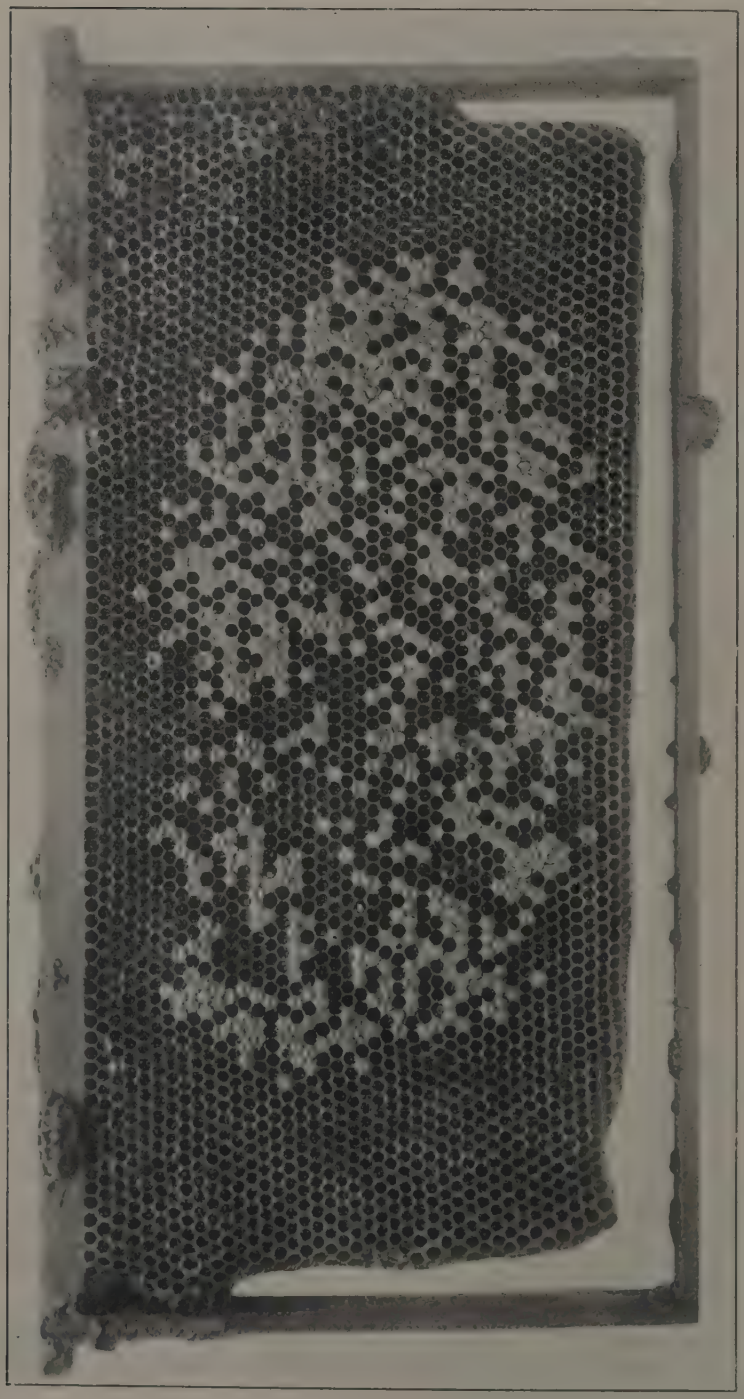

PLATE 57.—BROOD COMB INFECTED BY AMERICAN FOUL BROOD.

The ease with which the dead larvæ can be removed and the absence of ropiness will distinguish chilled brood, overheated brood, and starved brood from foul brood.

American foul brood attacks colonies of all strengths and at any season. The exact influence of climate has not been worked out, but it is generally considered that the disease is virulent in all climates in which bees are kept. There is no natural recovery from disease; a colony may die out rapidly or it may live for several years. The most rapid spread of the disease in a hive takes place when most brood is being reared, the quantity and quality of food available having little influence. Most new infections of hives occur when robbing is at its height. All races and strains of bees are susceptible. Bees attempt to clean out the disease by removing the dead brood, but as it breaks and leaves a portion of the infective material they are not successful. The disease is spread by contaminated honey obtained by the bees as honey fed to them by the beekeeper, as honey obtained by robbing infested hives or exposed frames from infected hives, or as honey left adhering to the sides of containers.

Precautionary Measures.

There is no known system of beekeeping which will surely prevent the appearance of American foul brood in an apiary, but the following precautionary measures will help to keep it away:—

(1) As far as possible prevent robbing.

(2) Do not feed honey bought on the market to bees.

(3) In introducing bought queens, destroy the accompanying cage, candy, and workers unless certain that the queen came from a disease-free apiary.

(4) If buying colonies, be sure they are disease free.

(5) Do not purchase old comb frames, &c.

Should the disease be present in an apiary, treatment is necessary. If only a few colonies are affected or the affected colonies are very weak, complete destruction of these colonies is desirable.

Treatment.

Destruction.—After the bees have stopped flying in the evening, close the entrance tightly. Sprinkle ½ pint of petrol over the top bars of brood combs. Close the top tightly. This will kill the bees. Next take the hive to a good fire in a hole sufficiently large to hold all honey which will run out of the combs as these are being burnt. Open the hive and place the combs one at a time on the fire. Finally add the hive with its cover, floor board, dead bees, &c. After everything has been burned cover in the hole.

Where complete destruction is not advisable the shaking treatment is used.

Shaking Treatment.—The treatment must be carried out during a honey flow, as at other times robbing from the frames as they were being removed would spread the disease. For the treatment the beekeeper requires a clean hive with frames and foundation only. He should also have a spare hive with a good cover besides his smoker and a newspaper.

The infected hive is smoked lightly. The hive with its floor board and cover is removed from its stand, and the clean hive put in its place with the newspaper spread out and weighted down in front of it. The infected hive is then opened and the frames removed one by one, the bees being shaken and brushed off on to the newspaper in front of their new quarters. It is desirable to shake the first frame as near to the entrance as possible, so that the bees quickly find their way in and do not wander excessively. As the frames are shaken they are placed in the spare hive and covered immediately to protect them from any possibility of robbing. When all the frames have been removed the last bees are shaken from the hive. After most of the bees have entered the hive, the newspaper should be burned and a strip of queen excluder placed over the entrance, to be removed after a few days. The old infected material should be removed and the frames burned by placing them separately on a good fire in a pit. The brush used should also be burned. The infected hives may be burned or may be saved for future use. In the latter case they should be cleaned and the insides carefully burned with a blowlamp till the wood appears scorched. Owing to the highly resistant state of the spores of *B. larvæ*, ordinary chemical disinfectants are quite unreliable for the disinfection of hives which have contained American foul brood. Special methods of disinfection have been evolved, but these are expensive and difficult of application.

While burning of all infected material is recommended, beekeepers treating numerous diseased hives may save the honey and wax. It is only advisable to attempt to extract the honey if it can be done in a securely screened honey house. Otherwise robbing during the extraction would spread the disease. The honey so extracted is quite safe for human consumption, but owing to the danger that bees may obtain access to receptacles which have contained contaminated honey, it should not be sold publicly, and due precautions taken in its use. The honey should on no account be fed to bees unless it is first sterilised by diluting it with an equal quantity of water and boiling vigorously for half an hour. The wax must all be rendered, and all refuse remaining burnt. The wax may then be safely used for comb foundation, &c.

In treating infested hives and handling infested material every precaution should be taken to prevent bees from robbing contaminated honey. Care should be taken not to spill such honey, or if it is spilled it should be carefully gathered and burned.

The hands should be well washed after handling the infected material, and the hive tool, smoker, bee veil, and any other instruments liable to become contaminated should be washed in hot water and washing soda. When brood raising commences after the shaking treatment it should be carefully watched for any recurrence of the disease. Should it recur, a second treatment must be given without delay.

TAKEN THE JOURNAL FOR THIRTY YEARS.

A well-known and progressive dairy farmer in the Pomona district writes (23rd January, 1931):—"I have had the 'Queensland Agricultural Journal' for thirty years, and always look forward to it, and appreciate the help I get from the Department."

THE OCCURRENCE OF A BEETLE (*Onthophagus granulatus* Bohen) IN THE STOMACH OF DOMESTICATED ANIMALS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

THE occurrence of Scarabæidæ in the intestinal tract of human beings in India and Ceylon is so frequent that the condition, though seldom or never serious, has a definite vernacular name, being in Sinhalese "Kurumini Mándâmâ" or beetle disease. In Australia, a dung beetle, *Macropocopris symbioticus* Arrow, lives in the anus of wallabies, and so far as the writer is aware this is the only published record of such beetles occurring in the intestinal tract of any animal other than human beings. The purpose of these notes is to record the presence of the bettle *Onthophagus granulatus*, from the stomach of the horse and calf.

The first instance of these beetles being found in the stomach of a horse was reported by Stock Inspector Comiskey, of Boonah. The animal was reported to have been ill for a period of three weeks. During this time little food was taken and the bowels were not known to have functioned. A post-mortem examination revealed large numbers of this beetle in the stomach, which was so extensively perforated that a large quantity of the contents had escaped.

A few months later specimens were forwarded for identification by Stock Inspector Taylor, Maryborough, who reported their occurrence in numbers in the paunches of calves which had died six to twelve hours after the first symptoms of illness. As more detailed information of infestations was not given, it cannot be said for certain that the animals had died as a result of the presence of the insects.

Little is known of the habits of *Onthophagus granulatus* except that it is to be found frequenting dung. The manner of infection can only be guessed at, but probably occurs either by swallowing the eggs, larvæ, or adults, or by the active efforts of the adults themselves. As these beetles or a similar species have been observed clinging to the anus of horses, the second explanation is more probably correct. It is presumed that the beetles are attracted to the anus whilst the animal is lying down, and, once entrance is gained, work their way up to the stomach.

STUDY OF QUEENSLAND GRASSES.

There is at present working on the botanical staff of the Department of Agriculture and Stock a botanist from England, Mr. C. E. Hubbard, who is a specialist on grasses. Mr. Hubbard intends leaving for England about the middle of April, but before he leaves is anxious to see as many specimens of Queensland grasses as possible. Specimens from far Northern and Western places are particularly desired, but any specimens are welcome, even of cultivated or naturalised grasses in the more settled parts of the State.

A request is made, therefore, to farmers and graziers to forward specimens to the Government Botanist, Botanic Gardens, Brisbane. If they are numbered and a duplicate or notes on the specimens sent is kept, then names corresponding to numbers and any information the Department possesses about the grasses can be forwarded in return. In this way the service can be of mutual benefit.

Specimens should consist of several flowering or seeding stems gathered from the base and bent backwards and forwards so as to roll comfortably in a piece of newspaper. The specimens should preferably be dried a short time before posting.

TUBERCULOSIS IN PIGS.

HOW IT AFFECTS THE FARMER'S POCKET.

COSTS PIG RAISERS MANY THOUSANDS OF POUNDS EACH YEAR.

DIRECTIONS FOR CONTROL.

What is Tuberculosis?

Tuberculosis is a disease of animals, humans, and birds, and is caused by a germ known as the tubercle bacillus.

Although animals under all conditions may contract the disease when exposed to infection, ill-nourished animals, and particularly those kept under insanitary conditions, are more likely to develop tuberculosis than animals that are well fed and cared for. Tuberculosis in pigs is usually associated with bad sanitation.

The organism causing the diseased condition may be transmitted to an animal through the food or drink, by inhalation, or by way of an abrasion of the skin. Once entrance is gained by the tubercle bacillus, the diseased condition (which is really a growth of tubercular nodules, and a degeneration of body tissues affected) develops in the animal's body, and any portion of the body may become affected; the parts which are usually first affected in the pig being the lymphatic glands of the throat, the lungs, and the intestines.

The disease is usually localised for a time, but later the germs may enter the blood stream when all parts of the body become affected, the condition known as generalised tuberculosis ensues. The rate of development of the disease is influenced by the virulence of the germs and the physical condition and resistance of the animal.

In the early stages, the disease is not easily detected. However, when the pig's carcass is submitted for examination by the meat inspector after slaughter, the tubercles, if present, are readily seen, particularly when the larger lymphatic glands throughout the body are examined.

In the advanced stages of tuberculosis, animals usually lose condition, have a harsh staring coat and skin, a persistent cough is frequently present, the eyes are dull, and the superficial lymphatic glands are sometimes noticed to be swollen and hard to the touch.

A peculiar feature about tuberculosis is the fact that, when a pig first becomes infected with the disease, there is seldom any outward appearance of unthriftiness and the pig may fatten rapidly, but eventually the disease gets a strong hold on the animal's body and emaciation becomes very apparent.

The Significance of Tuberculosis to the Queensland Pig Industry.

Tuberculosis is a dread disease among humans as well as among stock, and its presence in animals and their products used as food is a source of great danger to man; this gives reason for the existence of rigid systems of meat inspection in all civilised countries. Among other things, scientific meat inspection causes the condemnation and confiscation of meat infected with tuberculosis.

During the year 1929-30, of 318,350 pigs' carcasses examined 4,348 were condemned, representing 1·365 per cent., by State Government meat inspectors for tuberculosis in Queensland. In the same period,

PLATE 58.

Fig. 1.—The inspector is seen examining the lymphatic glands in the throat and neck.

PLATE 59.

Fig. 2.—Illustrates inspection of the lymphatic inguinal glands in the groin.

17,736 pigs' heads, representing 5·571 per cent., were also condemned. This represents a considerable loss to the industry and serves to emphasise the fact that concerted effort should be directed towards the eradication of the disease, as far as is practicable, before it reaches more serious dimensions. Apart from the number of pigs condemned at the slaughtering establishments, there are a number which die on the farm from tuberculosis, and the extent of this loss although considered serious cannot yet be estimated.

Pigs which, if sent to the bacon factory as porkers or baconers would have been found tubercular, are sometimes retained for breeding, and in many cases are active sources of infection to other pigs on the farm.

How the Pig Becomes Infected.

The germs may escape from the body of an infected animal in its milk, in discharges from the nose and mouth, in the droppings or in portions of the carcass which may be eaten by pigs, and by ingesting any of these body secretions the pig takes into its body the germs which cause the disease.

It is now accepted that congenital infection is very rare, but young pigs may become infected by milk and body discharges from a sow that is suffering from tuberculosis.

Unquestionably the use of milk from tubercular cows is the chief cause of pigs contracting the disease. Pigs which are allowed to drink raw milk or raw milk products, such as butter-milk or whey—either of which comes from a tubercular cow—may contract the disease.

The milk from one tubercular cow may infect all the milk with which it is mixed, and so pigs drinking any of this milk in an uncooked state would be liable to infection.

From a public health point of view and to ensure that nothing but thoroughly sound meat passes into the consumers' hands, a rigid system of meat inspection is practised at each of the bacon factories and pork-slaughtering establishments. Figs. 1, 2, and 3 illustrate different phases of this work, which is carried out under arrangement with the factories by Government meat inspectors.

The farmer has to carry the loss of all "condemns," hence it is in his interests also to eradicate disease in pigs and ensure a thoroughly healthy meat supply to the consuming population.

Control Measures.

I. Provide sanitary and comfortable accommodation for stock. Don't overcrowd pigs, but allow them ample room in well-drained grazing paddocks where possible. Use only well-made hygienic troughs and keep them clean. Remember that exposure to direct sunlight will destroy the tubercle bacillus, and so arrange sheds and troughs that direct sunlight will reach every part thereof.

II. When new stock have to be purchased, endeavour to secure them from healthy herds, and use only well-grown and vigorous pigs for breeding. Be cautious in the purchase of stores, and remember that it should be safer to breed pigs than to buy them in the open market.

III. Don't be too sparing with the food, but feed pigs plenty of wholesome foods in well balanced proportions, so that they will grow rapidly and be able to resist disease.

PLATE 60.

Fig. 3.—Illustrates inspection of the various lymphatic mesenteric glands and other portions of the viscera.

IV. If there is any reason to suspect tuberculosis on the farm have your dairy herd and your pigs inspected by an official of the Department of Agriculture and Stock so that necessary action may be taken. The services of the Department are at the disposal of the farmer, and arrangements may be made for an officer to inspect a dairy herd and to apply the tuberculin test to suspected cows. The tuberculin test is recognised throughout the world as being a safe and sure means of diagnosis.

V. Unless milk or milk products come from proved tubercle-free herds, it is advisable to pasteurise the milk before feeding it to pigs. This is recommended because it is well known that the germ is destroyed if held at a temperature of 155 deg. Fahr. for twenty minutes or at 180 deg. Fahr. for five minutes. Therefore, all doubtful milk should be heated to these temperatures as a safeguard against infection of pigs. In this direction buttermilk and whey should be efficiently pasteurised at the factories before being used as pig food.

VI. No diseased meat is allowed by law to be fed to any animal; but it is advisable that all meat fed to pigs should be thoroughly cooked in order to destroy any tubercle bacilli that may be present.

VII. Don't allow pigs to run in the same paddock as cattle, unless the cattle are proved tubercle free, as infection may be carried through the pigs eating their droppings.

VIII. Isolate for at least four weeks introduced pigs in a pen separate from other pigs. Also isolate any sick pig on the farm.

NOTE.—It should be remembered that although tuberculosis and other diseases cause farmers a considerable financial loss, the public is safeguarded by a thorough system of meat inspection that is carried on throughout the State by qualified Government meat inspectors.

Communicate with the Department of Agriculture and Stock for any further information on this matter.

THE FARMER AS AN ADVERTISER.

In an endeavour to increase the local consumption of pork products and focus attention upon the quality of the goods available, Mr. Mat Porter, a veteran Berkshire breeder, of Rosclock, Wondai, Queensland, recently adopted a novel and successful scheme of advertising. Mr. Porter has been successful over a long series of years at both country and State Royal Shows and has accumulated a goodly number of trophies, cups, prize ribbons and cards. To more effectively draw attention to these he arranged for the manufacture into bacon of a number of selected pigs from his property, and when cured and ready for sale these pork products were exhibited in the show window of one of the local stores, together with descriptive cards, explanatory of the objective of the scheme. The storekeeper also increased his advertising vote to draw attention to reduced prices for bacon and ham by newspaper, circular, 'phone, and letter, advertised the goods he had for sale.

The result, to use Mr. Porter's own words, was that "whereas ordinarily, if the storekeeper sold 3 or 4 lb. of bacon in a day he was doing well, following on the display of these products there was a regular rush for the bacon and he cut up two flitches into rashers and sold them out and had to cut up a third and also two hams to meet the demand. The store never had such a rush of trade," continues Mr. Porter, "and it shows that if the business is judiciously handled quite a lot can be done by the individual breeder to encourage an increase in the consumption of these very appetising and nourishing meat products."

WEIGHING PIGS ON THE FARM.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

AS both pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per pound paid varies according to specified weight limits, it is important to the pig raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in very many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Even after years of practice guessing the weight of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, as with intelligent use they will soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

PLATE 61.

Figure 1.—A wooden crate suitable for weighing pigs. Note the strong construction, "slide-up" doors at both ends, and wires coming from bottom of crate to be attached to the hook of the spring balance. Softwood should be used in the construction of the crate so that its weight will not be too great.

When a weighing appliance is installed on the farm, it will also be found useful for numerous purposes, both at the piggery and on other sections of the farm. With the equipment for weighing pigs and pig foods the farmer is able to carry out experiments in various methods of feeding and managing his pigs, the scale registering for him the advantage of one method over another.

Regular weekly weighings of young pigs will give a good indication of their rate of growth, and this really measures up the efficiency of the pig-raising business on the farm. If Saturday morning is the chosen time for this job, the children will be home from school and they would be very helpful to the farmer. With some organisation and quiet handling of the pigs, the weighing can be performed in comparatively little time and without much excitement to the pigs. The ease with

which pigs can be weighed in a crate has been demonstrated by many Pig Club members who are able to crate their pig and weigh it without the assistance of another person.

The illustrations included in this article show suitable appliances for weighing pigs with a crate and a spring balance, a lever being used to move the crate off the ground when the pig is in, thus allowing the balance to take the weight.

A 300-lb. spring balance is required, as a crate will weigh approximately 100 lb. and a bacon pig weighs up to 170 lb. alive; a 300-lb. spring balance costs approximately £5 15s.

The crate should be light but strong, and a convenient size for a crate to hold one bacon pig is 3 feet 6 inches long, 2 feet 6 inches high, and 1 foot 6 inches wide (inside measurements).

Plate 62.

Figure 2.—Crate in position, ready for use with front door closed. Note the arrangement of the top beam, lever and spring balance.

If the weighing crate is arranged in a race, the pigs can be brought from their yard, weighed, and then returned to the yard most conveniently.

There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig raisers. Special platform scales with a pig crate built on can be purchased at prices around £50, but at such a price their use must be limited to places such as very large piggeries and trucking yards where large numbers of pigs are weighed.

SUGGESTED FORM FOR KEEPING WEIGHT RECORDS OF EACH LITTER OF PIGS.

Litter No.	Date of Weighing.	Live Weight.	Total Gain in Weight (lb.).	Daily Gain in Weight for Week, in lb.	Remarks.
1 (A)	1st March, 1931	28			
(B)		30			Litter born 4th January, 1931, from "Topsy." Weaned 1st March, 1931. Ten born; eight weaned.
(C)		34			
(D)		29			
(E)		33			
(F)		31			
(G)		36			
(H)		30			
		251			
(A)	8th March, 1931	31	3	·4	
(B)		34	4	·5	
(C)		37	3	·4	
(D)		32	3	·4	
(E)		37	4	·5	
(F)		35	4	·5	
(G)		39	3	·4	
(H)		35	5	·7	

A simple method of ascertaining the estimated dressed weight of bacon and pork pigs when the actual live weight is known is as follows:—(This is approximate only, but acts as a guide.) Say live weight is 170 lb.

170 lb. x 7 = 1,190 lb. Strike off last figure thus:—1,19Ø leaving the estimated dressed weight of 119 lb., i.e., 70 per cent. of the actual live weight. Porkers should be marketed when between 60 lb. and 100 lb. dressed weight and baconers when between 100 lb. and 120 lb. dressed weight.

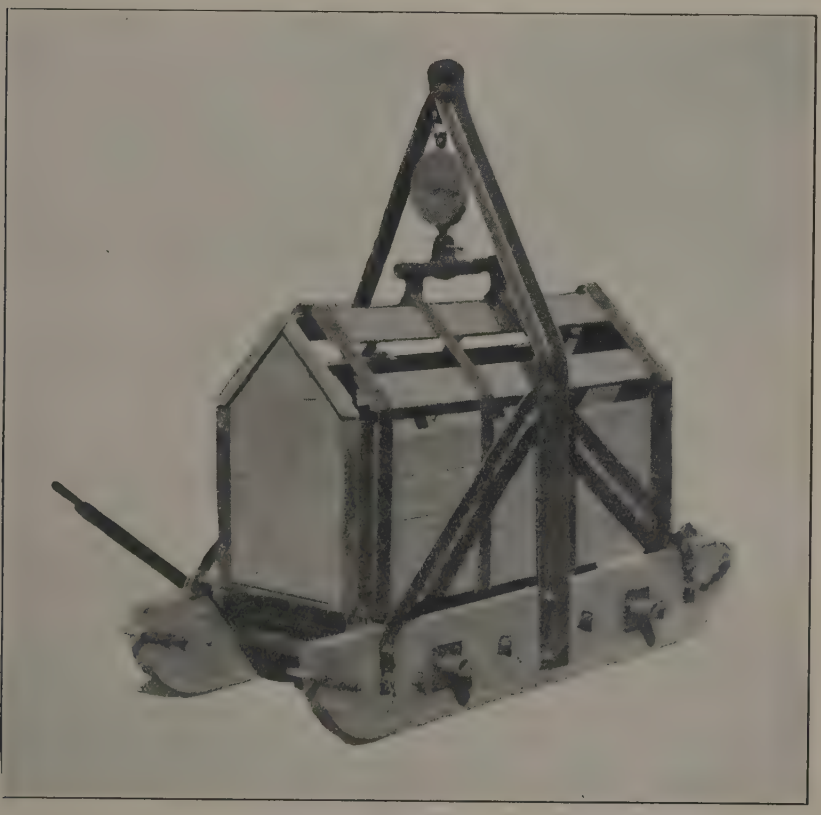

Plate 63.

Figure 3.—A movable weighing appliance for porkers and baconers, designed, constructed, and patented by the Forster Engineering Works of Brisbane. This weigher has been in use at several Pig Club Shows in Queensland and has proved satisfactory. It is built on two skid runners; the iron lever on the side enables the crate to be suspended, putting the weight on to the spring balance which is hung on the top of the frame. The sliding bar below the balance allows the operator to adjust the balance if the pig stands to one end of the crate. The doors at both ends of the crate slide up at the top so that the pig may walk in at one end and out the other.

CASTRATION OF PIGS.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

RECENT inquiries indicate that there are still numerous farmers who neglect to attend to the operation of castration on young boar pigs not intended for use as stud sires, until these pigs are three, four, or even five months of age. This is a serious mistake and results in considerable pain and loss of growth plus additional risk both from death as a result of complications and reduced value on slaughter for after effects in the form of improperly healed wounds and other objectionable features. Many otherwise suitable pigs are rejected for export and are classed as second or third grade as a result, even if they are passed as fit for human consumption.

The following rules should be strictly observed in order to avoid loss and ensure a satisfactory job:—

(1) Realising that there is no more important job associated with the raising and marketing of pork and bacon pigs than that of having animals of the right type in the best condition at the time they go forward to the factory or buyer, no effort should be spared to study closely the correct methods of handling, castration, &c.

(2) Castration is a simple surgical practice, essential in the preparation of male pigs for the meat market. Experience and observation will enable even the beginner to carry the operation through without loss if the correct methods are followed.

(3) It is preferable for the inexperienced to have some initial training in the operations by assisting an experienced operator if this is possible; otherwise practice on a porker already slaughtered and dressed or on a pig that has died of one or other complaints causing fatalities.

(4) In all cases carry out the operation on pigs six weeks of age if this can be arranged. There is considerable risk when working on a more mature animal, and the operation is a very much more difficult one.

(5) There is no need to attempt speying of the female pig, as this operation is not necessary in ordinary practice on Australian farms.

(6) The animal should be without food for at least fifteen hours before the operation is performed. In the case of young pigs not yet weaned, do this by taking the sow away from the suckers and placing her in a clean pen away from sight or sound of her family, or make some similar arrangement in the case of older pigs. In any case the pig should have an empty stomach at the time of the operation, though there is no objection to the pig having clean drinking water during this temporary fast. This is even more important in the case of aged pigs. They should fast for twenty-four hours or more.

(7) Have your castrating instruments, cloths, bucket, &c., thoroughly clean and in good order. Sterilise the knife and cloth by placing in boiling water for a few minutes before use, and then cool off or immerse in a strong disinfectant before and after operating on each pig. The knife should have a keen edge. It is not necessary to use an emasculator in the case of very young pigs, but this instrument should always be used when older pigs are being castrated, particularly for aged boars (if it has been decided worth while operating on an aged animal). The fact that so many pigs suffer intense pain, or even succumb as a result of castration, that they suffer as a result of the formation of abscesses or tumors in the scrotum (or sac in which the testicles are normally situated), and that the resultant wounds fail to heal rapidly or other complications follow, is invariably due either to carelessness, ignorance, or improper methods. A great many of the troubles can be traced to performing the operation in unfavourable weather, in insanitary surroundings, and last but not least to the use of unclean instruments. It is not uncommon to see farmers take out their pocket knives that have, possibly, been used for cutting tobacco or what not, give them a rub up on an oilstone, steel, or the back of their boot, and proceed to castrate their pigs without any sterilisation or treatment by dipping the knife in disinfectant. The result is frequently infection by germs and abscess formation with suppurating wounds that will not heal. The writer has seen pigs castrated in sties where they were ankle deep in the mud and slush. The operator's hands should be cleansed, as also should the cloths used for washing the parts before and after the operation. A clean bowl or bucket and a supply of lukewarm to hot water is also essential. The experienced operator will be able to do the work rapidly and with little or no trouble, the latter depending largely upon the skill of one or more of his attendants, for in the case of an aged pig it certainly is a two (or more) man job.

A good castrating knife that will keep a keen edge may be purchased at from 6s. to 10s. A 3-inch blade is a convenient size for ordinary castration. Emasculators are much more expensive, being quoted at from 50s. upwards according to make and size. Emasculators with a triple crush action are to be preferred for ordinary farm work. Absolute cleanliness in all operations is essential to good results.

(8) Select a clear, dry, cool day during which to perform the operation of castration—the animals should not be operated on during a cold rainy day nor during very cold windy weather. When it is possible to do so, avoid the operation during early spring, when blowflies are so active. All the pigs that are to be operated upon should be placed in a pen just large enough to hold them; this is to facilitate catching them and to lessen excitement among the animals. Another pen cleansed as mentioned above should be close at hand to receive the pigs after each one is completed.

(9) As disinfectants, use a 3 per cent. solution of some carbolic disinfectant, or sheep dip, or Jeyes' or Condy's Fluid.

Suitable antiseptic oils for use (after the operation and in order to keep flies from worrying the animals) may be made up from the following receipes:—

Recipe No. 1.—Specially advised for farm and homestead use for application to open wounds, sores, &c., is made up by dissolving 1 oz. of iodoform in 14 fluid oz. of eucalyptus oil. When quite clear add 1 pint of olive oil. Shake well and bottle and label distinctly "Antiseptic Oil No. 1."

Recipe No. 2 is more suitable for aged pigs in which the wounds are more pronounced, and in which the healing process is more lengthy. It combines the active ingredients of the above with a more tenacious and adherent basis. Olive oil is replaced by Stockholm tar. The formulæ in this case will be: Dissolve 1 oz. of iodoform in 14 fluid oz. of eucalyptus oil. When dissolved and quite clear add 1 pint of Stockholm tar. Shake well, bottle and label distinctly "Antiseptic Oil No. 2."

These antiseptic oils are much preferable from a humane standpoint, and, as they stimulate natural healing processes and repel flies, are to be recommended in preference to kerosene and fat or other bush remedies.

NUTRITION OF SHEEP.

By J. C. BRÜNNICH AND W. R. WINKS.

ANALYSIS OF PAUNCH CONTENTS.

IT has always been a great difficulty to obtain samples of the food consumed by sheep on pastures; and in times of drought, with scarcity of grass, it is often a mystery to ascertain on what material the sheep actually live. When obtaining samples of roughage, grass, stubble, &c., it is frequently the case that the samples submitted for analysis are really the food refused by the animals, unless the stalks show actually signs of being bitten off. One of the great advantages of giving phosphatic licks to sheep on pasture is the fact that the animals are induced to take more bites of such coarse roughage and are better able to digest such fodder than animals which get no licks.

As the paunch or rumen of any ruminant is simply considered a large reservoir for the storage of the bulky food consumed by the animal, it was thought that the analysis of the contents of paunches would give a reliable indication of the actual composition of the food consumed, but unfortunately this apparently does not apply to all the constituents, and the addition of large amounts of saliva adds considerable amounts of mineral matters, more particularly phosphoric acid, to the food contained in the rumen. In many cases, however, valuable information can be obtained from the analysis of paunch contents. Already last year, in the annual report of the Agricultural Chemist, the analysis of the paunch contents of a 1½-year-old wether, killed in the Longreach Blackall district (Analysis 2541, Table I.), was reported and commented on.

Food at that time was very scarce; the roughage of Mitchell and blue grass in the paddocks contained only about 4 per cent. of crude protein with 0.36 per cent. of lime and 0.27 per cent. P_2O_5, whereas boree and gidgea leaves contained 11.4 per cent. protein, 3.4 per cent. CaO, and 0.15 per cent. P_2O_5, so that the wether must have consumed a very considerable amount of leaves of such shrubs to give a paunch content with 11.4 per cent. protein, 3.14 per cent CaO, and 0.68 per cent. P_2O_5. At

that time of reporting a possible increase of the P_2O_5 contents in paunch due to saliva was not suspected. We were not able to find in any of the literature available a complete analysis of sheep saliva. In the "Tabulæ Biologicæ" we find sheep saliva to contain 98.9 per cent. water and 1.1 per cent. solid matter; human saliva with 99.5 per cent. water and 0.3 per cent. organic solids and 0.18 per cent. ash, and the ash itself to contain about 14 per cent. chlorine, 37 per cent. potash, 17.7 to 25.7 per cent. phosphoric acid, and only 2.2 to 3.9 per cent. lime.

Assuming the ash of sheep saliva to be of similar composition, the large amount of P_2O_5 in paunches is easily accounted for. The analysis of liquid—a few ounces collected in the paunch of a sheep purposely killed—(Table IV.) shows it to contain 98.2 per cent. water, 0.86 per cent. organic solids, and 0.94 per cent. ash, with 0.05 per cent. chlorine, 0.20 per cent. P_2O_5, and 0.036 per cent. CaO, which agrees very closely with the quoted analysis.

The food consumed by the wether under discussion was evidently too low in phosphoric acid, and the deficiency was made up by a supply of this necessary mineral constituents by the saliva. This phosphorus deficiency is aggravated by a great excess of lime, a very common occurrence with our scrub feeds, and the nutrition of sheep in the Longreach-Blackall district would undoubtedly be greatly benefited by a supply of phosphatic lick, as the supply of the necessary phosphoric acid from the body of the animal itself through its saliva to the food cannot go on for ever.

An Interesting Comparison.

It is interesting to compare the analysis with the analyses of paunch contents of well-nourished aged wethers from Pittsworth and Thane (Analyses 2628 and 2146, Table I.), where the sheep received satisfactory rations. A large number of analyses of paunch contents from the Springsure district are also of interest, particularly as the sheep lived under droughty conditions, and the effects of the use of phosphatic licks is clearly shown.

The results of the analyses carried out during the year were so startling that it was considered advisable to kill sheep which were fed under control and were available at the Yeerongpilly Stock Experiment Station in connection with stomach worms investigation, for the purpose of securing the contents of all the digestive organs.

The first sheep killed, September, 1930 (Table II.), was fed on ordinary lucerne chaff, but had also a little picking on a particularly bare paddock. The analysis of the contents of paunch and other stomachs do not show anything abnormal, only the amount of P_2O_5 is about double the amount expected.

The next sheep killed (Table III.) was kept the whole time in a stall and was fed with lucerne chaff only, and was in fair condition. The sample of the lucerne was taken from bulk and also from the food in the feed box, and the two analyses agree very closely. The contents of the paunch were again lower in protein and carbohydrates than was found in the feed, but higher in fibre and ash, higher in lime, and very much higher in phosphoric acid, containing practically three times as much phosphoric acid as was found in lucerne. The quite astonishing increase in the protein amount found in the small intestines was thought to be due to an admixture of chyme, as the intestines were squeezed to get the contents, but this is evidently not the case, as the stomach contents of the last sheep killed (Table IV.) showed a similar increase.

The last sheep killed in December was also kept in a stall and fed for several months on a fair quality of bush hay, which was too poor in protein to supply an adequate balanced ration; the sheep fell away rapidly and was very emaciated when killed. The protein in the paunch contents was considerably higher than that of the food, and phosphoric acid again showed a very large increase. Very remarkable is the great loss of chlorine from food to paunch. The composition of the few ounces of free liquid found in the paunch has already been referred to, and is evidently practically pure saliva. The contents of the small intestine were obtained without any pressure, but simply by cutting the intestines open with a pair of scissors.

The change of human saliva in quantity as well as in composition by various foods is a well-established fact, and it would be interesting to ascertain if saliva of a sheep varies with the class of food, more particularly if continued use of a phosphorus-deficient fodder will increase the amount of phosphorus in the saliva, and if the large amount of phosphoric acid in circulation is influenced by supplying phosphatic licks.

TABLE I.—CONTENTS OF PAUNCHES OF VARIOUS SHEEP.

		Lab. 2,541, Paunch. Isis Downs, Blackall. Killed, 28-11-29.	Lab. 2,628. Paunch. Dunbar, Pittsworth. Killed, —-11-30.	Lab. 2,146. Paunch. Torridon, Thane, S. W. Line. Died, 27-10-30.	Lab. 598. Paunch No. 1. Meteor Downs, Springsure. Killed, 25-7-30.	Lab. 1,227. Paunch No. 2. Meteor Downs, Springsure. Killed, 29-8-30.	Lab. 1,665. Paunch No. 3. Meteor Downs, Springsure. Killed, 22-9-30.	Lab. 1,948. Paunch No. 4. Meteor Downs, Springsure. Killed, 11-10-30.	Lab. 2,608. Paunch No. 5. Meteor Downs. Springsure. Killed, 1-12-30.	Lab. 2,609. Fæces, Meteor Downs, Springsure. Killed, 1-12-30.	Lab. 1,690. Lamb's Paunch. Meteor Downs, Springsure. Died, 24-9-30.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Mositure on Air-drying		6·4	6·5	2·1	8·2	9·1	7·2	8·6	7·1	6·4	9·6
Analysis of water-free material.	Crude Protein	11·4	17·9	17·4	15·2	12·9	13·6	14·4	11·7	8·0	12·6
	Carbohydrates	38·3	31·2	35·5	41·6	34·0	43·2	41·5	41·9	39·9	34·0
	Crude Fat	1·2	1·1	1·0	1·4	1·2	1·1	1·1	1·6	2·0	2·3
	Crude Fibre	32·2	31·9	29·3	22·5	26·6	21·1	21·3	23·6	18·9	29·1
	Crude Ash	16·9	17·9	16·8	19·3	25·3	21·0	21·7	21·2	31·2	22·0
	Lime (CaO)	3·139	2·539	2·220	0·744	2·022	0·917	1·249	1·062	1·747	1·932
	Phosphoric Acid (P_2O_5)	0·678	2·401	2·354	1·642	3·345	1·982	2·133	1·210	1·735	3·153
	Total Sulphur (S)	..	0·334	0·741	0·260	0·254	0·213	0·281	0·223	0·210	0·228
	Potash (K_2O)	..	1·692	..	0·988	0·940	..	..	1·00	0·580	..
	Total Chlorine (Cl_2)	..	0·258	..	..	..	..	..	0·328	0·144	..

Lab. 2541.—From 1½ year wether in good condition, killed for mutton.
Lab. 2628.—From an aged wether in prime condition, killed for mutton; fed on an excellent mixture of pasture including young wheat.
Lab. 2146.—From a 6½ years old wether, asphyxiated while being given a drench. The animal had been on mixed pasture for 24 hours prior to death, before which time he had been fed on lucerne.
Lab. 598.—From an old wether in fair condition.
Lab. 1227.—From a fat wether that had been without lick for some time Run on short burned feed where cattle had been, and which was without sheep for some time. Had access to lick shortly before being killed.
Lab. 1665.—From a fat wether on ordinary sheep country. No lick for two months prior to death.
Lab. 1948.—From a wether in a paddock containing only "white seed" yet sheep went from poor condition to good mutton.
Lab. 2608.—Grazed under store conditions similar to Lab. 1948. Potassium permanganate at the rate of 38 lb. to twenty thousand gallons added to water; given as an alleged cure for stomach worms.
Lab. 1690.—Paunch of a lamb that died from a disease similar to tetanus. Death may have been caused by a poison weed.

TABLE II.- ANALYSES OF CONTENTS OF PAUNCH AND OF THE DIGESTIVE ORGANS OF A SHEEP SLAUGHTERED 23RD SEPTEMBER, 1930.

	Lab. 1,543. Paunch or Rumen.	Lab. 1,544. Second Stomach or Reticulum	Lab. 1,545. Third Stomach, Bible or Omasum.	Lab. 1,546. Fourth Stomach or Abomasum.	Lab. 1,548. Blind Gut or Cæcum.	Lab. 1,547. Fæces before Excretion.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture on Air-drying	6·2	5·6	4·6	3·2	4·5	4·1
Analysis of water-free material. Crude Protein	19·0	19·1	16·0	18·0	13·0	14·2
Carbohydrates	33·4	33·9	35·6	30·3	38·7	39·2
Crude Fat	1·1	0·6	1·3	4·4	1·4	1·9
Crude Fibre	33·9	30·0	30·6	23·8	27·4	26·7
Crude Ash	12·6	16·4	16·5	23·5	19·5	18·0
Lime (CaO)	1·625	1·684	2·114	1·666	2·910	2·860
Phosphoric Acid (P_2O_5)	1·743	2·261	2·493	2·951	1·436	1·538
Total Sulphur (S)	0·242	0·246	0·238	0·366	0·243	0·179

s sheep was fed on lucerne chaff and grass picking only. It had no lick of any kind.

TABLE III.—ANALYSES OF FEED AND MATERIALS FROM THE DIGESTIVE ORGANS OF A SHEEP SLAUGHTERED 4TH NOVEMBER, 1930.

	Lab. 2,173. Paunch or Rumen.	Lab. 2,174. Second Stomach or Reticulum.	Lab. 2,175. Third Stomach. Bible or Omasum.	Lab. 2,176. Fourth Stomach or Abomasum.	Lab. 2,177. Blind Gut or Cæcum.	Lab. 2,179. Small Intestine.	Lab. 2,178. Fæces before Excretion.	Lab. 2,181. Fæces from Pen after Excretion.	Lab. 2,180. Urine from Bladder. †	Lab. 2,182. Lucerne Chaff from Bulk Sample as Fed to Sheep.	Lab. 2,183. Lucerne Chaff actually taken from Feed Box of Sheep.
Moisture on Air-drying	Per Cent. 6·5	Per Cent. 10·9	Per Cent. 12·1	Per Cent. 8·5	Per Cent. 10·2	Per Cent. 7·2	Per Cent. 13·3	Per Cent. 8·1	Per Cent. ..	Per Cent. 10·3	Per Cent. 10·3
Analysis of water-free material. Crude Protein	22·1	22·2	20·7	27·6	17·3	35·7	17·4	18·3	Nitrogen 0·87	26·2	26·1
Carbohydrates	27·1	26·0	26·2	*24·6	29·9	*32·2	30·2	31·6	..	40·5	40·2
Crude Fat	1·7	2·1	2·5	Sample too small	2·1	Sample too small	2·4	1·7	..	1·5	1·5
Crude Fibre	35·7	34·6	36·8	25·2	35·1	20·7	37·4	34·5	..	21·2	20·7
Crude Ash	13·4	15·1	13·8	22·6	15·6	11·4	12·6	13·9	..	10·6	11·5
Lime (CaO)	2·108	2·364	3·644	1·958	4·366	1·980	4·417	4·807	..	1·823	1·798
Phosphoric Acid (P_2O_5) ..	2·568	3·223	3·980	3·062	2·146	2·620	1·697	2·165	0·0145	0·846	0·837
Total Sulphur (S) ..	0·286	0·378	0·280	Sample too small	0·318	0·805	0·359	0·356	0·070	0·262	0·238
Total Chlorine (Cl_2) ..	0·527	Sample too small	0·856	Sample too small	1·059	1·454	0·401	0·218	0·163	0·760	0·760

* Includes crude fat. † Absolute analysis of liquid, not of water-free material.

Total weight of offal including heart, liver, &c., 22 lb. 13 oz.
Total weight of contents of Digestive Organs, 12 lb. 10 oz.
Weight of empty Digestive Organs, 5 lb. 4 oz.
Weight of heart, liver, &c., 4 lb. 15 oz.
P.H. of Second Stomach, 6·66 (Quinhydrone).
P.H. of Fourth Stomach, 5·65 (Quinhydrone).

Weight of Contents of—
Paunch, 9 lb. 13 oz.
Second Stomach, 5½ oz. with 75·7 per cent. moisture.
Third Stomach, 4½ oz. with 80·5 per cent. moisture.
Fourth Stomach, 6½ oz. with 94·0 per cent. moisture.
Blind Gut, 14½ oz. with 84·6 per cent. moisture.
Fæces, 6 oz. with 74·0 per cent. moisture.
Small Intestine, 7 oz. with 76·8 per cent. moisture.

TABLE IV.- ANALYSIS OF FEED, PAUNCH, AND STOMACH CONTENTS OF A SHEEP SLAUGHTERED 11TH DECEMBER, 1930.

		Paunch or Rumen.										
		Lab. 2,773. Solid.	Lab. 2,784. †Liquid, chiefly Saliva.	Lab. 2,774. Second Stomach, or Reticulum.	Lab. 2,775. Third Stomach, Bible or Omasum.	Lab. 2,776. Fourth Stomach or Abomasum.	Lab. 2,777. Blind Gut or Cæcum.	Lab. 2,779. Small Intestine.	Lab. 2,778. Large Intestine.	Lab. 2,780. Fæces just before Excretion.	Lab. 2,781. Urine from Bladder. †	Lab. 2,813. Roughage Fed to Sheep.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture on Air-drying		7·9	§98·2	7·2	5·0	6·4	8·7	6·8	14·7	7·8	..	8·3
Analysis of water-free material.	Crude Protein	10·3	0·189 Nit. ·029	9·1	11·5	16·7	10·4	24·4	8·8	9·5	5·31 Nit. 0·85	6·5
	Carbohydrates	40·4	..	*33·5	43·4	..	43·5	*40·2	44·0	*46·9	..	45·8
	Crude Fat	0·5	..	Sample too small	1·2	..	0·8	Sample too small	0·9	Sample too small	..	0·7
	Crude Fibre	33·6	..	42·7	26·3	..	23·7	16·0	24·5	23·4	..	34·9
	Crude Ash	15·2	0·94	14·7	17·6	30·3	21·6	19·4	21·8	20·2	..	12·1
	Lime (CaO)	0·608	0·036	0·966	0·730	0·718	0·957	0·601	0·945	1·021	..	0·537
	Phosphoric Acid (P_2O_5)	1·741	0·201	1·918	1·875	1·732	1·610	2·037	1·608	1·664	0·009	0·678
	Total Sulphur (S)	0·206	0·016	Sample too small	0·204	..	0·265	0·749	0·322	0·372	..	0·252
	Total Chlorine (Cl_2)	0·270	0·053	Sample too small	0·642	..	0·988	1·883	1·166	0·593	0·213	0·797

* Includes crude fat. † Absolute analysis of liquid, not of water-free material.
§ Total solids, 1·804 per cent.; organic matter, 0·86 per cent.; mineral matter (ash), 0·94 per. cent.

Sheep was emaciated and dressed sheep weighed only 26 lb.
Weight of Contents of Digestive Organs, 10 lb. 14 oz.

Weight of Contents of—
Paunch, 8 lb. 11 oz. with 82·3 per cent. moisture.
Second Stomach, 1 oz. with 83·9 per cent. moisture.
Third Stomach, 6 oz. with 82·2 per cent. moisture.
Fourth Stomach, 1 oz. with 89·6 per cent. moisture.

Total weights of Digestive Organs and Contents with Heart, Liver, &c., 20 lb. 7 oz.

Weight of Contents of—
Blind Gut, 9 oz. with 83·5 per cent. moisture.
Small Intestine, 10 oz. with 75·7 per cent. moisture.
Large Intestine, 1 lb. with 85·2 per cent. moisture.
Fæces, 4 oz. with 75·1 per cent. moisture.

CLIMATOLOGICAL TABLE—JANUARY, 1931.

Supplied by the Commonwealth of Australia Meteorological Bureau, Brisbane.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means.		Shade Temperature. Extremes.				Rainfall. Total.	Rainfall. Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·82	89	76	97	3	72	21	1145	16
Herberton	..	84	66	94	3	59	1	406	10
Rockhampton	29·87	94	75	104	3, 12	69	29	324	7
Brisbane	29·91	89	72	100	11	67	21, 22 29	454	10
Darling Downs.									
Dalby	29·88	95	..	107	2, 6	..	..	143	6
Stanthorpe	..	88	60	99	13	53	4	165	5
Toowoomba	..	87	63	99	12	56	23	623	10
Mid-interior.									
Georgetown	29·80	97	75	107	4	67	1	609	10
Longreach	29·79	103	75	112	12	66	3, 29	50	2
Mitchell	29·85	97	69	107	12, 13	53	21	143	4
Western.									
Burketown	29·79	93	76	105	4	71	12	804	13
Boulia	29·79	103	76	115	7	66	21	119	2
Thargomindah	29·83	95	74	106	8, 13, 17	63	19, 26	19	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of January, in the Agricultural Districts, together with Total Rainfall during January, 1931, and 1930 for Comparison.

Divisions and Stations.	Average Rainfall. Jan.	Average Rainfall. No. of Years' Records.	Total Rainfall. Jan. 1931.	Total Rainfall. Jan. 1930.
North Coast.	In.		In.	In.
Atherton	11·65	29	10·42	23·99
Cairns	16·24	48	17·42	33·06
Cardwell	16·46	58	11·72	38·58
Cooktown	14·21	54	11·45	30·60
Herberton	9·63	43	4·06	17·46
Ingham	15·94	38	11·54	25·24
Innisfail	20·03	49	20·63	34·67
Mossman	15·08	17	29·77	42·93
Townsville	11·29	59	1·43	17·58
Central Coast.				
Ayr	11·44	43	3·95	14·36
Bowen	10·20	59	2·09	20·46
Charters Towers	5·54	48	1·43	11·19
Mackay	14·22	59	3·82	30·70
Proserpine	16·14	27	10·00	28·53
St. Lawrence	9·62	59	2·28	17·47
South Coast.				
Biggenden	5·38	31	2·03	9·83
Bundaberg	9·06	47	2·79	15·92
Brisbane	6·49	80	4·54	9·94
Caboolture	7·77	43	11·05	11·17
Childers	7·82	35	2·99	14·02
Crohamhurst	12·74	37	..	22·91
Esk	5·84	43	4·06	7·71
Gayndah	4·72	59	1·40	9·29
Gympie	6·75	60	5·56	12·11
Kilkivan	5·64	51	4·21	10·89
Maryborough	7·54	58	1·34	11·34
South Coast—continued:				
Nambour	9·91	34	11·58	20·28
Nanango	4·75	48	6·01	3·92
Rockhampton	8·34	43	3·24	26·59
Woodford	7·95	43	8·97	15·15
Darling Downs.				
Dalby	3·32	60	1·43	3·86
Emu Vale	3·31	34	1·15	1·32
Jimbour	3·65	42	2·19	2·31
Miles	3·78	45	1·27	2·31
Stanthorpe	3·62	57	1·65	2·08
Toowoomba	5·03	58	6·23	6·49
Warwick	3·58	65	1·98	2·03
Maranoa.				
Roma	3·26	56	1·24	1·53
State Farms, &c.				
Bungeworgorai	1·98	16	1·04	2·16
Gatton College	4·14	31	3·51	5·95
Gindie	3·74	31	4·39	6·83
Hermitage	3·31	24	1·68	1·56
Kairi	8·60	16	10·21	25·80
Mackay Sugar Experiment Station	14·34	33	4·12	28·94
Warren	5·22	15	..	14·16

GEORGE G. BOND, Divisional Meteorologist.

BUTTER MAKING FOR HOME CONSUMPTION.

IN the parts of this State where dairying is in general practice, it has become the custom to forward the cream raised on the farm to a butter factory, where the cream is received, treated, and manufactured into butter. To those supplying cream in this way to the factory, the process of manufacture of small quantities of butter on the farm is generally well understood. However, there is a number of persons scattered throughout the State who milk one or more cows, and have neither the desire nor the opportunity to tender the cream from the milk to a butter factory, but, on the other hand, they are anxious to make butter from the cream. Frequently, advice upon the procedure to be followed in so doing is sought from this office, and it is with the object of meeting inquiries of this nature that the subsequent simple particulars are supplied relative to the production of milk and cream, and the manufacture of the latter product into butter. The more important matters for observation will be referred to in their natural sequence.

Flavour.

Primarily it must be understood that the flavour of butter is influenced by—(*a*) the class of food to which the cows have access, (*b*) the degree of cleanliness practised in the handling of the milk and cream, and the skill exercised in the manufacture of the butter.

Many varieties of weeds and some useful fodders are capable of conveying objectionable flavours or taints to milk, and, in turn, the tainted flavour is noticeable in the cream, and ultimately the flavour of the butter is affected.

The tainting influence of fodders is minimised by feeding same to cows directly after milking, but not immediately preceding same.

Thorough cleanliness is necessary to prevent contamination of the milk or cream. The cow-bail and place where the cow is milked must have an impervious floor, and be kept in a clean and sweet condition. The udder, teats, and flanks of the cow should be washed and wiped prior to milking. The hands of the person who intends to carry out the milking should be cleansed similarly.

The milk should never be exposed to an impure atmosphere.

Strain the milk without delay after it is drawn from the cow by running it through a very fine-mesh gauze or, preferably, through a strainer fitted with a wad of sterilised cotton.

The milk should next be passed through a separator, or set in dishes to allow it to cream, the separator proving by far the more satisfactory means of obtaining the cream. If setting of the milk in dishes has to be resorted to, it will be found that shallow dishes, which provide a comparatively large surface for the cream to gather upon, are more satisfactory than deeper vessels with a limited surface.

Generally the milk is allowed to sour, or even coagulate, before the cream is skimmed off, but no more cream can possibly rise to the surface after the milk has thickened. The layer of cream is removed with the aid of a utensil termed a "skimmer," the customary makeshift being a tablespoon. The objective should be to collect as much cream as possible, but to avoid gathering any of the milk with it.

The cream should be placed in an enamelled vessel and should be kept as cool as possible. It must not be brought into contact with a tainted atmosphere, for the cream readily absorbs odours from such a source.

It is advisable not to mix the cream obtained by individual skimmings, or separations of the milk, until some hours before churning time, when the whole of the cream available for churning should be placed in one receptacle and allowed to ripen uniformly. Always avoid the mixing together of hot and cool cream.

A certain amount of lactic acid should be permitted to develop on the cream before churning, and this usually requires from thirty-six to forty-eight hours, according to the care taken and the temperature at which the milk and cream are held. Holding either milk or cream at comparatively high temperatures expedites the development of the acidity.

Temperature.

Generally natural temperatures in Queensland, particularly during the warmer season of the year, are too high to give satisfactory results in the churning of cream, and to remedy this difficulty artificial cooling of the cream by the aid of an ice-chest is advantageous. The water used for butter-washing purposes may be placed in a vessel and similarly cooled in the ice-chest. A more primitive means of cooling the cream is to stand the vessel containing it in water drawn from an underground well or spring; another method is to make a canvas jacket to cover the vessel holding the cream, and to arrange that the edges of the canvas covering reach a supply of water, which is drawn up by capillary attraction, and acts on the same principle as the cooling of water in a water-bag.

Usually good results in churning are obtainable by having the cream at a temperature of 56 degrees to 58 degrees Fahr. during the cooler months of the year, and reducing the temperature of the cream preparatory to churning several degrees lower throughout the warmer season.

Dairy Requisites.

In butter-making there are certain requisites and appliances that must be provided, even in cases where primitive methods are practised. Firstly, an ample supply of both hot and cold water must be available. The cold water is necessary for the purpose of washing the butter, and the hot water is required for use in cleansing and scalding the dairy utensils.

The water may be drawn from either a tank or well supply, provided it is wholesome. What is known as "hard" water from a well supply may be employed for washing the butter, so long as this condition of the water is caused by the presence of salt or limited percentages of other mineral matter not injurious to health. Water containing decayed vegetable matter should not be used for washing butter.

To recover the cream from the milk, either milk setting-pans or a separator is required. The setting of milk in pans to allow the cream to rise is not to be viewed as a satisfactory or economical method of recovering cream from milk. In the first place, there is the risk that the surface of the milk will catch a deal of fine dust particles from the atmosphere while awaiting for the cream to rise; another disadvantage is, that a large percentage of the butter-fat content of the milk is not recoverable by this method. A small-sized separator provides by far the more advantageous means of recovering the butter-fat from milk. Separators of a wide range in skimming capacity are procurable, and one should be secured of a capacity in agreement with the complement of milk to be treated.

A churn is necessary. There are many types of churns that have been designed to meet the requirements of those who desire to churn, for their own use, small quantities of cream. Generally, all are capable of churning satisfactorily. For convenience the churn should be simple in construction, durable, and so designed as to be readily cleansed.

Two butter pats for use in working and salting the butter should be provided.

Hand power butter-workers are procurable on the market, but such appliances (while admittedly most serviceable) are more suited to cases wherein the operations of the butter-maker are carried on in a comparatively large scale. In instances where it is intended to manufacture sufficient butter to satisfy the requirements of a family, the two pats are to be made to perform successfully the working and patting of the butter. This process can be carried out in a clean shallow dish if so desired.

A dairy thermometer is a most useful article, and should be included in the equipment of the dairy; and by its aid the temperatures of cream or water may be determined from time to time.

Churning.

Churning is simply a mechanical process for bringing together the butter-fat globules in the cream in order to make them coalesce or unite. Preparatory to the churning of cream, the utensils used in connection with the process should be dipped in scalding water and then rinsed in clean cold water.

The whole of the cream from the various skimmings or separations of the milk (that should have been cooled and mixed in a container for some hours prior to churning time) is placed in the churn and the churn is put into operation.

If the churn is of a design that allows the operator to view the cream while churning, it will be noticed that, after some little time under the churning process, the cream will assume a paste-like consistency and possess a smooth texture. At a later stage the cream will appear to increase in density, and subsequently the texture will appear gritty. This gritty appearance of the texture of the cream is occasioned by the unison of the fat globules, and indicates that the churning is nearing completion. Care should be taken at this stage that no cream is allowed to remain stationary on the sides of the churn, and any cream attached thereto should be removed and brought under the influence of the "paddles" of the churn with the main bulk of the cream. Otherwise a portion of the cream will remain unchurned, and be carried away and lost with the butter-milk.

As soon as the cream "breaks," it is advisable to add a small quantity of cold water to flush the sides and paddles of the churn, using about half a pint of water to each quart of cream in the churn. Carry on with the churning process until the globules gather in particles about the size of a grain of wheat. Now stop the churning and allow the butter to float upon the butter-milk, which should then be drawn off. In the case where the temperature of the cream is higher than it should be for correct churning, the butter-fat fails to assume a granular appearance, but gathers rather in the form of a mass of soft fat. However, this does not call for any change in the procedure in so far as the draining off of the butter-milk is concerned. When this is done, add wash water to the churn, and wash the butter, working the butter with the pats in order to eliminate the butter-milk as thoroughly as possible. The temperature of the wash water should be several degrees below that specified for the cream. It is well to remember that the incorporation of an excessive amount of butter-milk in the butter will result in the keeping properties of the latter being prejudicially affected.

In some cases a second washing of the butter is advantageous, but this is dependent upon the degree of success attained in removing the butter-milk in the first washing. After the washing of the butter has been effected, add fine salt to the butter in the proportion of from three eighths to half an ounce of salt to each pound of butter.

Work the butter steadily with the pats, taking care not to injure the grain of the butter more than is necessary in expelling the excess of moisture. The working also mixes and incorporates the added salt with the butter.

If the churning of the cream has been carried out efficiently and correct temperatures observed and the butter properly washed, the moisture showing in beads on the finished article will be in the form of a crystal clear brine.

The butter is now ready for use, but as it is capable of absorbing odours given off by other strong flavoured foodstuffs, it should be stored away beyond attack from such influences in clean surroundings and kept as cool as possible.

ACIDITY IN MILK AND CREAM.

By CHAS. McGRATH, Supervisor of Dairying.

ACIDITY in milk is attributable to two causes:—

1. The presence in milk of acid phosphates and perhaps carbon dioxide. When freshly drawn milk gives an acid reaction to phenolphthalein it is owing to the presence of such substances.

2. The presence of lactic and other acids produced by the decomposition of the milk sugar by bacterial action. Lactic acid is not present in freshly drawn milk. It is developed at a later period and its development is influenced chiefly by the temperature at which the milk is kept.

Cooling milk to a temperature below 50 degrees retards the development and multiplication of bacteria responsible for the decomposition of the milk sugar and the production of lactic acid.

In dairy factory procedure the total acidity of milk is calculated as lactic acid.

The principle upon which the determination of acidity is based is the well-known chemical action of acids upon alkalies.

The exact point of neutrality is determined by the use of an indicator "Phenolphthalein" an organic compound having the property when in solution of turning pink with alkalies and remaining colourless with acids.

ACIDITY REDUCTION TABLE FOR CREAM.

Basis of Table:—·093 lb. soda bicarb. neutralises ·1 per cent. of acid in 100 lb. cream.

PERCENTAGE OF REDUCTION DESIRED.

..	·02	·04	·06	·08	·10	·12	·14	·16	·18	·20	·22	·24	·26	·28	·30	·32	·34	·36	·38	·40	·42	·44	..
BICARBONATE OF SODA REQUIRED IN POUNDS AND OUNCES.																							
lb. cream.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. cream.
50	0 0	0 0	0 0	0 0	0 0	0 1	0 1	0 1	0 1	0 1	0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 3	0 3	0 3	0 3	0 3	50
100	0 0	0 0	0 1	0 1	0 1	0 2	0 2	0 2	0 3	0 3	0 3	0 4	0 4	0 4	0 4	0 5	0 5	0 5	0 6	0 6	0 6	0 7	100
200	0 0	0 1	0 2	0 2	0 3	0 4	0 4	0 5	0 6	0 6	0 7	0 7	0 8	0 8	0 9	0 10	0 10	0 11	0 11	0 12	0 12	0 13	200
300	0 1	0 2	0 3	0 4	0 4	0 5	0 6	0 7	0 8	0 9	0 10	0 11	0 12	0 13	0 13	0 14	0 15	1 0	1 1	1 2	1 3	1 4	300
400	0 1	0 2	0 4	0 5	0 6	0 7	0 8	0 10	0 11	0 12	0 13	0 14	0 15	1 1	1 2	1 3	1 4	1 5	1 7	1 8	1 9	1 10	400
500	0 1	0 3	0 4	0 6	0 7	0 9	0 10	0 12	0 13	0 15	1 0	1 2	1 3	1 5	1 6	1 8	1 9	1 11	1 12	1 14	1 15	2 1	500
600	0 2	0 4	0 5	0 7	0 9	0 11	0 12	0 14	1 0	1 2	1 4	1 5	1 7	1 9	1 11	1 13	1 14	2 0	2 2	2 4	2 5	2 7	600
700	0 2	0 4	0 6	0 8	0 10	0 12	0 15	1 1	1 3	1 5	1 7	1 9	1 11	1 13	1 15	2 1	2 3	2 5	2 8	2 10	2 12	2 14	700
800	0 2	0 5	0 7	0 9	0 12	0 14	1 1	1 3	1 5	1 8	1 10	1 13	1 15	2 1	2 4	2 6	2 8	2 11	2 13	3 0	3 2	3 4	800
900	0 3	0 5	0 8	0 11	0 13	1 0	1 3	1 5	1 8	1 11	1 13	2 0	2 3	2 5	2 8	2 11	2 14	3 0	3 3	3 6	3 8	3 11	900
1000	0 3	0 6	0 9	0 12	0 15	1 2	1 5	1 8	1 11	1 14	2 1	2 4	2 7	2 10	2 13	3 0	3 3	3 6	3 9	3 12	3 14	4 1	1000
2000	0 6	0 12	1 2	1 8	1 14	2 4	2 10	3 0	3 6	3 12	4 1	4 7	4 13	5 3	5 9	5 15	6 5	6 11	7 1	7 7	7 13	8 3	2000
3000	0 9	1 2	1 11	2 4	2 13	3 6	3 14	4 7	5 0	5 9	6 2	6 11	7 4	7 13	8 6	8 15	9 8	10 1	10 10	11 3	11 11	12 4	3000
4000	0 12	1 8	2 4	3 0	3 12	4 7	5 3	5 15	6 11	7 7	8 3	8 15	9 11	10 7	11 3	11 14	12 11	13 6	14 2	14 14	15 10	16 6	4000
5000	0 15	1 14	2 13	3 12	4 10	5 9	6 8	7 7	8 6	9 5	10 4	11 3	12 1	13 0	13 15	14 14	15 13	16 12	17 11	18 10	19 8	20 7	5000

TRACTOR SCHOOL AT GATTON.

The Queensland Agricultural High School and College, in conjunction with the Council of Agriculture, will hold the eighth Queensland tractor school from the 31st March to 10th April inclusive.

The course will cover lectures, demonstrations, and practical work in the care, adjustment, repairs, and driving of many makes of tractors.

At the last school there were present the following tractors: Caterpillar (10-14 h.p. and 15-20 h.p.), Massey-Wallis (12-20 h.p. and 20-30 h.p.), Case (model C and model L), Fordson (1930 model), McCormick-Deering (10-20 h.p.), Cletrac (30-48 h.p.), Twin City (17-28 h.p.), Stock (16-28 h.p.), Lanz (20 h.p.), Auto Rotary Cultivator, British Wallis (15-25 h.p., college owned), Cletrac (12-20 h.p., college owned), two Fordsons (college owned).

The cost to each farmer will be £3 9s. 6d., which will cover all instruction costs, board and residence, and recreation fee.

The Railway Department will grant attending farmers one-half excursion rates each way on presentation of a certificate from the college.

The college will provide power kerosene, the railage on tractors from and to Brisbane, and free board and residence for tractor mechanics.

Farmers should book to College Station and ask the guard to stop, previously advising the college of the train by which they will travel.

Farmers will need to bring blankets, sheets, mosquito nets, pillow slips, towels, soap, mirror, and other toilet requisites.

No farmer will be allowed to confine his attention to a particular tractor, but must work each in turn. Should he desire more work on a particular tractor he will have to arrange it in his spare time.

Applications from farmers wishing to attend the school will be received from now onwards; early applications will be given preference.

Any further particulars will be supplied on request.

FRUITGROWING IN NORTH QUEENSLAND.

Mr. H. F. Walker, Secretary for Agriculture and Stock, has received the following report (28th January, 1931) from Mr. H. J. Freeman, Senior Instructor in Fruit Culture, Cairns, on the position of the Fruit Industry in the North during the past few months.

IN almost every citrus orchard a very heavy crop has set, and if no setback is received from weather conditions, large consignments will be handled when this fruit matures. Spraying is very necessary, and unfortunately those who have not already taken this precaution will be given very little opportunity during the next few months, for the recognised wet season of North Queensland is almost at hand.

Both smooth and rough varieties of pineapples are very much earlier maturing in the North compared with the South. Brisbane market prices have apparently been too low to entice the forwarding of large consignments from the Northern centres, consequently most growers are trusting to local sales. Most of the rough variety are on the small side, due largely to the fact that the plantings are somewhat old.

Papaws, granadillas, and passion fruit are grown for local markets mostly, and at present are rather scarce.

Tomatoes are scarce owing to the growers endeavouring to cultivate this crop without spraying systematically.

The bulk of the mango crop in the North is collected from the few trees to be found round almost any farm-house throughout the North, mostly of different varieties, but in nearly every instance each variety could be improved. All the crop has been harvested, excepting around the Cardwell district.

Bananas are commanding a better position in the North and, from reports to hand, some fine fruit is being railed South. Local consignments are heavy, and prices are somewhat light. The fruit shipped to the South during October and November should have proved profitable to the senders, judging by the good returns to hand. December was rather a poor month for bananas owing to the quantity of temperate fruits coming forward. The Russell River banana area is easily the pick of the Northern districts, and by the end of next March some excellent consignments will have been recorded.

The North from a fruitgrowing point of view is creeping ahead, bananas and pineapples making the main foundation. Largely responsible for this movement is the opening of the Kyogle line and the weekly boat leaving Cairns and Townsville, thus making fast transport by either rail or sea to southern markets. The suitable weather over the past three months was an appreciable factor in the general progress.

Prospects of the Northern fruit industry depend for advancement on speedy, sure, and cheap transport to both the Southern and Queensland markets. In addition to this, three serious pests and diseases must be controlled—rust, leaf spot, and fruit fly.

The quality of the fruit produced is quite satisfactory, and there are large areas of land available for profitable horticulture, subject, of course, to adequate pathological control.

The progress over the past three months at the Bartle Frere Experiment Station is quite satisfactory. When once the plants at present growing in the nursery area (25,000) have been removed, conditions will greatly improve and a fine area of land for experimental purposes will be available. In the bananas trapping for beetle must be continued, and spraying the bunches for thrip every three weeks is necessary to keep the fruit clean. Netting all bunches against fly is an absolute necessity to ensure one against trouble from this pest.

ABSTRACTS AND REVIEWS.

"AGRICULTURAL RESEARCH IN 1929."

Royal Agricultural Society of England. 182 pages. Price, 1s. 3d.

The fifth volume of this annual summary of scientific and economic research work in agriculture, covering investigations conducted not only in Britain but abroad, in so far as dominion and foreign results are of interest to agriculturists, is now to hand. Started five years ago at the instance of the Research Committee of the Royal Agricultural Society, quite frankly as an experiment, the publication has now established for itself a definite place in the periodical literature of the farming industry. Farmers are naturally at a disadvantage not only in interpreting the results of scientific work but also in knowing where to look for them. They appear in periodicals not always accessible to the farmer and couched in language not always easily understood by him. His work lies around him on his farm; he has neither the time nor always, in these days, the means to study a multiplicity of journals and pamphlets, and thus it happens that the results of research work are often too slow in reaching those who are most concerned to know about them. Collected from all available sources, put together by acknowledged authorities, in non-scientific language, the contents of "Agricultural Research" should be studied by all those who wish to keep themselves abreast of the times in modern agricultural practice.

It is impossible to do more than to give some indication of the subjects dealt with in the new issue. In the section on "Crops and Plant-breeding," Professor Engledow has provided an interesting summary of the development of winter washes for fruit trees derived from tar oil. The way in which these washes act as destroyers of eggs of injurious insects is still uncertain, but of their effectiveness as winter washes there is no doubt, and their use may even dispense with the necessity for spring spraying in some orchards. For the arable farmer there are useful articles on varieties of sugar beet, and on the control of rust and smut disease of cereals. Mr. Mackintosh deals with questions of interest to the dairy farmer, and milk producers will give special attention to the section of his article on "Dairy Husbandry," dealing with the intensive manuring of grass land, even though it may require a good deal of courage in these days to lay out money on the intensification of production. The economic aspects of milk production are considered also in Mr. Orwin's article entitled "Agricultural Economics," where the question of the utilisation of surplus milk is discussed. In these days of low prices and high costs the question of the use of machinery on the farm is one of increasing importance, and some figures are given of cultivation costs with the use of a tractor, which farmers may compare profitably with their own horse labour costs. Following on the same subject, farmers should find much of interest to them in Dr. Owen's article on "Agricultural Engineering."

As in past years, Sir John Russell's notes on "Soils and Fertilizers" form one of the most important sections of the volume. It is satisfactory to read that the production of artificial fertilizers, particularly of nitrogenous manures, continues to expand, and in spite of economic difficulties, it seems that the cheapness of chemical fertilizers is making them increasingly attractive to farmers.

An article on "Veterinary Science," by Dr. F. C. Minett, Director of the Research Institute in Animal Pathology, deals with many matters of primary importance to the practical farmer. Amongst these, further experience is recorded of progress in combating that scourge of the cowkeeper, contagious abortion.

For the assistance of students and others desirous of consulting original sources of information, each section of "Agricultural Research" concludes with a complete bibliography of papers quoted. The Royal Agricultural Society of England, it should also be noted, is continuing the sale of the volume at the reduced price of 1s. 3d., in order to secure the widest possible circulation. The society's London address is 16 Bedford square, London, W.C.1.

UNPRODUCTIVE CITRUS TREES.

By H. BARNES, Instructor in Fruit Culture.

INQUIRIES are from time to time received from citrus growers in various parts of the State seeking the reason for the infertility of their trees, particularly Scarlet Mandarins. In the vast majority of cases the same answer can confidently be supplied—the trees have been propagated from an unprofitable source, i.e., they have been budded or grafted with wood taken from a shy-bearing tree. On the theory that "like begets like," it naturally follows that trees worked with wood from unproductive trees will themselves be unproductive.

An illustrative incident of this condition in Scarlet mandarin trees has lately been under observation on Mr. Karhula's orchard at Runcorn. The trees, which are about twelve years old, are growing in a light red sandy loam on the crown of a gentle rise. Mr. Karhula purchased the orchard several years ago as a going concern, and it was then in a somewhat neglected condition. Up to that time the trees were reported to have borne only one good crop, though it is extremely doubtful if this were true. Each year since taking over the orchard Mr. Karhula has endeavoured by means of intensive cultivation and heavy applications of artificial manures to bring the trees into bearing, but although they blossom profusely, very little fruit sets. Orange trees growing on an adjacent block responded freely to similar treatment, and continue to bear good crops.

Early in September last, when the trees were in blossom, an inspection was made and a slight abnormality was noticed in the flowers. They did not appear to expand as much as usual but seemed rather constricted. Having in mind the possibility of the presence of parasitic growths, it was decided to dust three trees with precipitated sulphur. On the advice of Mr. Mandelson, of the Pathological Branch of this Department, it was also decided to spray three other trees with Bordeaux mixture, leaving a check row between. This was done on three occasions with an interval of ten days to a fortnight between each operation. As a further experiment the trunks of two trees and several main branches of each of a number of other trees were cinctured shortly after the petals began to fall. Early in the season it appeared as if the order of things was to be reversed, and that all the trees would set a good crop, due no doubt to a good early spring.

As the summer advanced, however, and conditions became drier, the young fruit began to fall, and it soon became apparent that this was to be but a repetition of previous seasons. At the end of January in many of the trees it was difficult to find even a single fruit. The trees which were sulphured showed no benefit, whilst those which were sprayed with Bordeaux mixture showed, if any, only a very slight improvement. The trees and branches which were cinctured, however, showed up remarkably in comparison, as they had without exception set a very good crop. Where the two or three main branches forming on side of the tree were cinctured these were heavily laden with fruit whilst on the other side the fruit were few and far between.

A Natural Deduction.

The natural conclusion to be deduced from this evidence is that the fault lies in the constitution of the trees themselves, and since they have failed repeatedly to respond to cultivation and fertilizing, the only remedy that remains is to cut them back and work them over with wood from trees of proved value.

Remedy and Methods.

The method adopted in working over-grown trees of this nature is to remove the head of the tree during the winter when the tree is dormant by cutting back all branches to within 2 to 5 feet of the trunk, according to the size of the tree, and leaving only what is required to form a new head. During the spring numerous shoots will start from the branches remaining, and these may be thinned out after the first growth has hardened to three or four suitably place near the end of the shortened branch. Later these can be reduced to two. When the shoots are about 6 inches long the terminal growths should be nipped out to lessen their chances of being blown off by the wind, and also to "stiffen" the growth. During the following autumn the trees will be ready for budding, or they may be left until the spring. Trees worked over in this manner will carry a crop of fruit two years after working, and will rapidly attain the same dimensions as the original tree.

In some publications it is recommended that in heading back trees at least two branches be allowed to remain to act as draw branches to maintain the vitality of the tree. This may be necessary provided heading back is done at a period when the tree is in growth or during the wrong time of the year, but when the shortening is done during the winter, when the growth has terminated, the whole of the top may be safely removed without fear of the tree dying back; in fact, better results can be obtained when no "draw branches" are left, and the future shape of the tree can be more readily formulated.

The method of cincturing a tree (or ringbarking as it is sometimes called) is to entirely ring the tree through the bark with an ordinary pruning saw without injuring the cambium layer or the wood underneath. It is just as important that the bark be entirely cut through all the way around as it is not to injure the cambium. The idea is to check the flow of sap, and if the operation is performed at the right time -that is, about ten days to a fortnight after the petals of the flowers begin to fall—it enables the tree to set and hold its fruit better. In the case of a hollow or depression in the trunk of a tree which cannot be reached with the saw, the bark may be taken out to the same width as the saw cut with a pruning knife. The wound will soon heal over leaving only a very slight narrow scar.

FERTILISER TRIALS AT ELIMBAH.

PINEAPPLES AND CITRUS.

By H. BARNES, Instructor in Fruit Culture, Brisbane.

PINEAPPLE PLOT.

Drainage.—Reference was made in a previous report that a portion of the plot required draining and that the effect of the excessive moisture round the roots of the plants was reflected in the growth. This defect has now been rectified. During September, under personal supervision, 500 ft. of 3-in. agricultural pipes were laid at a depth of 3 ft., comprising a main and four side drains. Owing to the long continued spell of dry weather up to December, no appreciable result has been noted in the growth of the plants under the influence of the drain, but now that the wet season has set in its effect will be interesting to record.

The application of the fertilizer mixtures set out in the following table were made in April and October, 1930, and so far as healthy colour and even growth and general appearance is concerned, row No. 2 is by far the best. The plants were not large at the time of inspection, but were growing well and there had been a marked change showing the benefit of the change over from Nauru phosphate alone under which the results were poor. The number of the fruit in the row was low, but should be very much better next season.

Row No. 7 (potash only), which in the previous report was the best, had lost its premier position. Though the plants were strong and fruit good, the foliage was pale, indicating lack of nitrogen.

Rows planted through paper mulch were generally sturdy plants and were much improved. One row, No. 3, had the highest number of fruit (136).

One noticeable feature was that rows to which blood had been applied showed much long, narrow sword-leaf growth. On appearances its application, at least in large amounts, is not to be recommended.

PINEAPPLE FERTILISER EXPERIMENTS AT ELIMBAH.

PLOT—FOURTEEN DOUBLE ROWS, 9 FT. (CENTRE TO CENTRE) APART, 50 YARDS IN LENGTH.

Row No.	Nauru Phos.	Sulp. Amm	Sulp. Potash.	Blood.	Basic Super.	Bone.	Previous Remarks.	Present Condition.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.		
*1	..	..	..	..	..	..	Poor growth ..	Fairly strong plants; pale colour; growth fair. Number of fruit, 119.
2	15	10	10	..	..	..	No improvement..	Good even growth; colour very good and best in plot. Plants somewhat small though growing well and showing benefit of change over from Nauru alone. Number of fruit, 21
†3	24	..	..	14	..	..	Fairly good growth; pale foliage	Sturdy plants; growth fair; pale foliage. Best row for fruit, 136
4	..	..	..	20	..	..	Good colour; growth moderate	Growth variable; some long narrow sword-leaf growth; colour fair. Fruit, 79
5	..	10	16	10	..	..	Rather pale; fair growth	Growth very uneven; spindly narrow leaves; colour fair. Fruit, 52
†6	..	10	10	..	15	..	Pale; poor ..	Paper mulched; growth improved; colour good; somewhat uneven growth. Fruit, 52
7	..	..	20	..	..	..	Best row; good growth; fair colour	Good strong even growth; foliage very pale. Fruit, 88
8	..	..	18	18	..	..	Fair growth; good colour	Fair growth; some spindly plants. Colour generally good though variable with condition of plants. Fruit, 77
†9	16	..	18	14	..	..	Variable; very fair to good	Sturdy plants and good growth; colour fair. Fruit, 116
10	..	..	20	18	10	..	Fair growth and colour	Growth variable; fair to good; long narrow sword-leaf foliage. Fruit, 74
11	..	18	20	..	10	..	No improvement on 10	Colour slightly better than 10 and growth similar. Fruit, 49
†12	..	..	20	16	..	14	Poor	Fairly strong growth; colour good, growth uneven. Fruit, 74
13	..	{.. §10	‡30 §10	..	..	..	Weak growth ..	Weak growth; colour good. Fruit, 77
*14	..	..	..	..	..	..	Poor	Poor. Fruit, 40

* Check Row. † Paper Mulched. ‡ Applied in April. § Applied in October.

CITRUS PLOT.

Complete fertilizers were applied to some trees, whilst nitrogenous manures only were given to others. At the time of inspection all the trees were looking very well and holding good crops of fruit. Comparative figures will be available later when the crop has been harvested.

SATISFIELD WITH THE JOURNAL.

A Bowen farmer writes (27th January, 1931):—"I am enclosing my subscription for the 'Queensland Agricultural Journal' for two years, as I consider it's the best money's worth in the Commonwealth for a farmer."

Answers to Correspondents.

Yeast in Cheese.

Inquirer—The Supervisor of Dairying, Mr. Chas. McGrath, advises:—

The development of yeast in milk and cheese is due to outside contamination and is difficult to avoid, particularly during hot weather. The yeast oxidises the lactic acid and creates conditions suitable for the development of putrefactive bacteria. The use of a pure lactic culture will be of service to cheese-makers. Care in the preparation and handling of the culture is essential in order to secure the benefits to be derived from its use. Starter cans and all other dairy utensils used in the preparation of the culture should be thoroughly cleaned, and sterilised by covering them with water kept at boiling for at least fifteen minutes.

Orange and Lemon Juice Preservation.

Replying to an inquiry, the Agricultural Chemist, Mr. J. C. Brünnich, advises:—

The preservation of orange and lemon juice is a very simple matter and presents no difficulties whatsoever. Concentrating such juice is quite out of the question because it involves vacuum pans, machinery, &c., which would only be used for a few months of the year. From information supplied by the manager of the C.O.D. no orange juice is imported from abroad, and the importation of Southern products could only be prevented if a health regulation prohibited the use of preservatives in such cordials. It is impossible to keep such products with certainty in barrels or other open containers without preservatives, but if kept in bottles or sealed containers the juices could be kept indefinitely for years. We ourselves preserved pineapple juice which was kept ten years, without any preservatives, and was of excellent quality and fresh flavour when opened. Any fruit juice can be kept indefinitely by a process of repeated pasteurisation, which simply means bottling or tinning the sterilised juice whilst hot and repeating the heating up to about 160 or 180 deg. Fahr. twice after sealing the containers after twenty-four hours intervals.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

White Sapote.

G.B.B. (Rockhampton)—

The specimen is the White Sapote (*Casimiroa edulis*), a native of Mexico and Central America. There are several named varieties, for the cultivation seems to have increased in recent years. The pulp is creamy but varies from very sweet in some varieties to rather bitter in others. The tree belongs to the family Rutaceæ and is not really related to the other Sapotes. The Aztec name for the fruit was Cochiztzapotl, the Sleep-producing Sapote. It is also known in Central America as Metasano or Kill Health, but there seems to be no foundation whatever for these names, and the cultivation of the fruit is now on the increase.

Cape Cotton.

C.P.R. (Gordonvale)—

The specimen is *Gomphocarpus fruticosus*, the Cape Cotton or Balloon Cotton, a native of South Africa now naturalised in many parts of the world. In Queensland it is sometimes grown as an ornamental plant, but is apt to become a pest; in fact, in some localities such as scrub farms between Brisbane and Gympie on the North Coast line it has over-run the country here and there to the exclusion of other plants. The bladder-like fruits contain a silk-cotton, but this has no value as a true cotton, but has some value as a kapok, though its collection for this purpose would hardly be a payable proposition. The stems contain a fibre, however, which might be put to commercial use.

The Young Farmer.

YOUNG FARMERS' CLUBS.

On his return from a visit to Great Britain recently, Mr. Philip Frankel, a councillor of the Royal National Agricultural Association, Brisbane, and a prominent Queensland business man, indicated that, while overseas, he was specially interested in junior farmer clubs and in the junior judging competitions. He favoured the scrapping of the present system of conducting judging competitions and substituting the English method, believing that the latter would be much more adaptable to conditions here. In discussing the junior farmer clubs, he explained that these clubs have been initiated for the purpose of giving young people a desire for knowledge of national things. They aim at providing training in stock raising of all kinds and in other branches of agriculture, in public speaking, and in the management of affairs generally. The members look after something which lives and grows, either animal, bird, or plant; and the living thing is made the basis of club activities which are designed to be educative as well as interesting. The types of stock kept by the club members in Great Britain include calves (dairy and beef), pigs, poultry, rabbits, and bees; as well as horticulture. As far as possible, the clubs are run by the members, assisted by grown-ups with special knowledge, who act as an advisory committee. The clubs have proved to be of very real value, tending to develop self-reliance.

In urging an extension of the junior farmer movement, Mr. Frankel indicated how boys might be equipped and encouraged to take up land for themselves, making them a national asset and better citizens, instead of seeing so many drift into the ranks of the unemployed.

[The junior farmers' clubs already initiated in Australia have proved of immense value in the direction indicated and an extension of them is highly desirable.—ED. "Q.A.J."]

POINTS FOR PIG CLUB MEMBERS.

IN a recent address to a gathering of children and adults, Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising, dealt with various attributes in Home Project Club membership and reminded his hearers that if success were to be attained it would only be through true co-operative effort and sympathetic interest. To succeed in any scheme it is essential that the club member has faith, not only in his or her ability to carry the work through, but in the ability of the other members of the club to co-operate. It is just as essential to have faith in others as in one self and it is necessary to have faith in the club organisers and in the scheme generally if best results are to be obtained.

The objective of the scheme is "to make the best better" and to teach certain definite lessons in practical agriculture. Before a commodity is produced some study should be given to the requirements of the consumer of that article and to the demand that exists or that can be built up. The law of supply and demand requires attention, though perhaps not so much from the point of view of the junior as from the senior farmer. There is a limit to the consumption of any product, and one of the lessons to be learned is as to how far farmers can safely go in the production of different products on the farm.

Overseas trade is capable of absorbing immense quantities of Australian products, but only at a price, hence one of the most important of the lessons taught is how commodities can be produced at a rate allowing of profitable disposal on overseas markets. Consumers' demands there, as well as here, are subject to fluctuation and careful attention must be given to these demands.

Years ago it was the common practice to market beef cattle at heavy weights and at six and seven years of age; these heavy grades are not now in demand, and the two-year old beast is the most profitable.

Heavy-weight, fat pigs were extremely popular and profitable twenty years ago, but are now a drug on the market and cannot be disposed of profitably; and so it is in other lines, hence, a study of the consumers demands is highly profitable. Costs of production, if they can be ascertained at all, need careful study, for it is certainly essential to reduce these costs to a minimum in order to reap additional profits. There are ways and means of creating additional demands, as was well known to Henry Ford when he commenced manufacturing motor-cars, and we have yet a great deal to learn in the direction of popularising our own products and building up additional market outlets. The fruit trade has learned that it pays to put on an "Eat More Fruit Campaign," just as the motor-car people advise the purchase of new and better motor-cars.

Climatic conditions and environment needed careful consideration in the development of agricultural projects, for there are certain districts in which one project will be much more successful than in others. As the population increases so both production and consumption increases and these matters are well worth careful study.

It is essential to learn the good points as well as the defective ones in all branches of stock raising. The only profitable demand is for early maturing, prime quality attractive trade lines, hence a study of trade classification becomes a necessity. There is no profitable demand for bruised, damaged, or otherwise abnormal carcasses in the meat trade, or for fruit or other products in an unmarketable condition. The by-products of the live stock industry are important, yet their value fluctuates considerably and it is essential to study these questions. In every direction there were points of interest and though all could not be learnt in one year, there is no reason why the junior farmer should not become conversant with them all.

"TO MAKE THE BEST BETTER."

The ambition of every 4 H club member in America, no matter in what project he or she may be working, is "To make the best better"; indeed this is their national club motto and is the goal towards which each member continuously aims.

Their club emblem is a four-leaf clover, in the centre of each leaf the letter H being woven, these letters representing Head, Heart, Hands, Health, all of which have their own special job in the building up of a strong, active, healthy membership. The head to plan and think out the various schemes; the heart to put them into operation and to maintain loyalty to club, community, and country; the hands to faithfully carry out the work thus planned and initiated; and the health to do the work to the best of the member's ability.

Up to the present no such club motto or club emblem has been adopted nationally in Australia, for the reason that each State has its own separate scheme and the keen rivalry existing between the different States has tended towards each adopting its own particular project.

It would be an advantage, however, if some acceptable scheme could be brought into operation, especially now that it is recognised there are advantages in an interchange of ideas and co operation in carrying into effect such schemes as Farm Boys' Camps at State Royal and Royal National Shows, and it is hoped the time is not far distant when there will be some further co-operation between the States in the endeavour to build up a strong national project scheme into which State barriers have no entry.

One can imagine what chaos would exist if every State in America attempted to work out its own scheme without reference to any Federal plan; it would be just as disastrous as an attempt at State Government as opposed entirely to Federal control in a country where there are so many individual States.

To make the best better, therefore, should be the objective in the higher sense, and from the national point of view is just as important and necessary as it is in the case of individual projects.

It is satisfactory meanwhile to note that the club movement is growing and to know that every year brings us a greater and wider membership with better work, more consistent interest and with much more satisfactory financial returns. There is a great future before the Home Project (Club) Scheme in Australia.

General Notes.

Sanctuary for Animals and Birds at Bowen.

An Order in Council under the Animals and Birds Acts has been issued declaring Muller's Lagoon, Bowen, to be a sanctuary in which it shall be unlawful for any person to take or kill any animal or bird. The full description of the lands in question is:—Portion 149, county of Herbert, parish of Pring, being a reserve for Lands Office paddock as proclaimed in the "Government Gazette" of the 30th May, 1914, folio 1395, having an area of 59 acres 1 rood 26 perches.

Extension of Cotton Board for Five Years.

The Queensland Cotton Board was constituted in 1926 for a period of five years which expires on the 31st December, 1931. On the 4th December, 1930, an Order in Council was issued giving notice of intention to extend the Board for five years from 1st January, 1932, until the 31st December, 1936; the closing date for the receipt of a petition for a poll to decide whether or not the Board should be extended was the 5th January, 1931, and as no petition was received by that date and in accordance with the provisions of the Acts, an Order in Council has now been issued extending the operations of the Queensland Cotton Board for five years from the 1st January, 1932, to the 31st December, 1936.

Staff Changes and Appointments.

Mr. S. Wilson, Police Magistrate, Cloncurry, has been appointed Government Representative on the Cloncurry Dingo Board.

Mr. H. Hacker, Entomologist, Queensland Museum, has been appointed an Inspector of Stock and Plants.

The appointment of Mr. H. B. Ford as an Inspector of Stock has been confirmed from the 22nd April, 1930.

Acting Sergeant C. Cryan (of Cooktown) and Constable E. Brown (of Kynuna) have been appointed also Inspectors of Slaughter-houses.

The following have been appointed members of the Northern Pig Board for the year 1931:—Messrs. R. Campbell (Peeramon), D. Johnston (Malanda), R. T. Croker (Malanda), F. H. Hyde (Peeramon), H. T. Skennar (Malanda), and E. Graham (Director of Marketing). Mr. R. T. Croker has been appointed chairman.

Northern Cane Prices Boards.

The following persons have been nominated as Canegrowers' Representatives on the respective Local Boards against which their names are set, and as the number in each case exceeds the number to be elected a poll will be taken on the day fixed for same—viz., the 7th March, 1931—for the Goondi, Inkerman, Kalamia, Mount Bauple, Pioneer, and Tully Local Boards, closing in all cases at 3 o'clock in the afternoon of the above date:—

Goondi.—W. J. Burke, W. D. Davies, and R. Lecase.
Inkerman.—S. W. Gibson, W. F. Klaka, F. J. Woods, and E. E. Turnbull.
Kalamia.—M. A. Coyne, B. S. Donovan, W. H. Ferguson, H. A. Wellington.
Mount Bauple.—W. J. Douglas, H. Jeppeson, R. A. Maike, and P. B. Scougall.
Pioneer—B. S. Donovan, L. W. J. Hoey, and W. C. Smith.
Tully.—H. N. Lund, A. Ronan, and J. A. Winter.

Arrowroot Board Election.

Nominations will be received by the returning officer, Department of Agriculture and Stock, Brisbane, on or before the 10th March, 1931, for election as growers' representatives on the Arrowroot Board. Five such representatives are to be elected for a term of three years by those growers who in the 1930-1931 season supplied arrowroot bulbs grown in Queensland to any arrowroot mill in Queensland. Each nomination is to be signed by at least ten such growers. If more than five nominations are received a postal vote will be taken. Persons eligible to vote are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Mackay District Cane Pest Board.

An assessment at the rate of 3d. per ton will be levied on every ton of sugar-cane received at the Cattle Creek, Farleigh, Marian, North Eton, Pleystowe, and Racecourse sugar works during the season 1931-1932, for the purposes of the Mackay Cane Pests Board. Such assessment is payable by the owner of the sugar works in the first instance, but such assessment shall be paid and borne by the owner of the sugar works and the grower of the cane, respectively, in equal proportions.

Control of "Newcastle" Disease of Poultry.

Regulations have been passed under the Diseases in Poultry Act designed to prevent the introduction of "Newcastle" disease of poultry, at present prevalent in Victoria, into Queensland. An Order in Council has been passed declaring "Newcastle" disease of poultry (pseudo poultry plague) to be a disease under the Act, and another has been passed declaring all finches, parrots, pheasants, and quail to be poultry under the meaning of the Act.

Regulations at present provide that poultry may only be introduced into Queensland on production of a declaration by the owner that such poultry are entirely free from disease and during the preceding three months have not been in contact with diseased poultry. Such declaration must be accompanied by a certificate from an inspector of poultry whence the birds have come, stating that he has examined them and has no reason to doubt the declaration. These regulations have now been amended to provide that, as well as producing the declaration and certificate as above, the owner of the poultry must also produce a certificate from the Chief Inspector of Stock or Chief Veterinary Surgeon in the State from which the poultry have come stating that there has been no outbreak of "Newcastle" disease in that State in the preceding twelve months, and that such birds are the product of such State or have been in that State for the last preceding twelve months. In addition, he must also deliver a permit to import issued by the poultry expert of the Department of Agriculture and Stock, Brisbane. In future, therefore, it will be necessary for any person desirous of introducing fowls, ducks, geese, turkeys, guinea fowl, pigeons, finches, parrots, pheasants, and quail from any other State of the Commonwealth into Queensland to produce the above declaration, certificates, and permit before being allowed to bring them into the State.

To Increase Dairying Profits.

As a means of increasing the margin of profit, greater production per acre should be the aim of every dairy farmer.

Feed regularly and plentifully. In addition to pastures, grow fodder crops, if possible, all the year round. Grow lucerne if possible, if only a quarter of an acre. During the autumn plant oats, vetches, wheat, barley, &c., and during the spring and summer grow maize, sorghum, saccaline, Sudan grass, &c. In addition to these, if you wish to get the maximum yield out of your cows, give them a little concentrated food, such as crushed oats, maize meal, bran (each two parts) mixed with lucerne chaff (eight parts).

Improve your pastures by top-dressing and the sowing of winter grasses and clovers. The pasture on land which has been used for dairying for a long period without any effort being made to return to the soil the mineral constituents which have been taken from it becomes deficient in such ingredients, and the animals that graze on it suffer. In most of our dairying districts there is need for a change of food from paspalum, which, in districts where frosts are experienced, produces little or no nourishing material in the winter. Better pastures mean healthier and more consistently productive cattle.

Divide your farm into small sections, say, of 10 acres each, and graze them off in rotation. Thus the cows have fresh, young pasture all the time, and their milk yields are increased.

Profit by the security afforded by a reserve of feed in the form of silage. The most convenient form of silo for the dairy farmer is the overhead type, but a stack silo is cheaply constructed, and where the soil is suitable a pit silo can be used. Silage is a good insurance against times of scarcity; it does not burn or deteriorate, and cows milk well on it.

Join a herd-recording unit. It is the most effective and cheapest way of getting at the yields of your cows. Put a pure-bred bull of known and recorded production strain at the head of the herd, keep his heifers out of the highest yielding cows, and as they come in cull out and sell to the butcher the low producers. It is wonderful how quickly the average yield of the herd goes up if it is managed on these lines.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE DISCOVERY OF VITAMINS.

LAST month we discoursed on the elementary chemistry of food. All that was then said was sound scientific truth, but it was not the whole truth. It is just this difference between the truth and the whole truth that the generality of mankind comprehend very imperfectly, if at all.

A few men, inspired by the real scientific spirit, endeavoured to increase their knowledge of diet by feeding small animals on extremely pure foods—carbohydrates, fats, and proteids—in sufficient quantity and varying proportions. These experiments were numerous and very carefully conducted. The results were always the same. The animals failed to develop properly, became badly nourished, and finally died. This discovery, together with the study of some previously ill-understood diseases - beri beri, scurvy, and rickets—led to the discovery of vitamins.

We do not yet know the whole truth about vitamins. There appears to be half a dozen of these necessary constituents of food; there may be more. They are present in very minute quantities in some foods only. Four of these vitamins are now well known, and for convenience are named vitamins A, B, C, and D. Very little is known of their chemical composition except in the case of vitamin D, and this is the only vitamin that has been made by artificial means. They are all present in varying proportions in some vegetable foods, and in some fresh animal foods such as milk and eggs. As the young animal lives exclusively on one of these last two foods, it follows as a matter of course that they must contain all the substances necessary for its nutrition and growth. In preserved foods they are frequently deficient or absent; absent also in the refined foods that are unfortunately preferred by those who have never been better taught.

Vitamin A is present in milk, cream, butter, eggs, and suet. It is deficient or absent in margarine, lard, and many vegetable oils. Liver and cod-liver oil are very rich in this vitamin, which is contained also in green vegetables and carrots. If his diet does not contain sufficient vitamin A your child will grow very slowly and will contract infections easily and recover from them with difficulty.

Vitamin B is present especially in the husks and embryos of cereals, and therefore in wholemeal bread, and in all foods made from whole grains. White flour, white bread, and polished rice contain none of this vitamin, which is very apt to be deficient in our diet. This is a probable cause of constipation, poor teeth, and a liability to infections. Vitamin B is readily supplied to the diet in the form of prepared bran, as a preparation of wheat embryos known as bemax, and in marmite, which is made from yeast.

Vitamin C is present in all fresh uncooked fruits and vegetables, but is easily destroyed by cooking. It is specially abundant in the juice of oranges and lemons. Its absence causes scurvy, a disease which has become very rare now, as most mothers give their children orange juice. The juice of tomatoes or of swede turnips are good substitutes.

Vitamin D is absolutely necessary for the growth of bones and teeth. It is present in the same substances as Vitamin A, more especially in cod-liver oil. This vitamin is formed in the skin under the influence of sunlight, and consequently rickets is a comparatively mild disease in Australia. Vitamin D can now be artificially prepared by the action of ultra violet rays on a substance which is present in many foods.

Food for Children.

No mother should have any difficulty in giving her children sufficient vitamins if she will take a little pains to give the foods which contain them in good quantity. Children should have milk, butter, eggs, fresh fruit, green vegetables, and wholemeal bread. If they eat ordinary bread they should have bran, bemax, or marmite. If the supply of vitamins A and D are insufficient they should have cod-liver oil. This is important, but it is still more important that expectant mothers should include these foods in their diet for the sake of their babies. They should continue them while suckling for the same reason. After weaning they should continue them for the sake of their own health. While diseases resulting from total absence of vitamins are rare, continued poor health, deficient growth, and a readiness to contract all sorts of infection are a common result of relative deficiency in any one or all of the vitamins. Fresh foods are always better than preserved foods. No woman can keep healthy for long on sugared tea with bread and butter and a bit of meat.

FLOWER GARDENING.

A PLEASANT AND INTERESTING HOBBY.

By H. BURTON-BRADLEY.*

For the making and cultivation of a garden it is necessary to possess certain tools, though others may be added from time to time. First of all, I would suggest a good spade, which requires to be kept bright and sharp—a 12-inch mill saw file is suitable for this purpose. Others necessary include a 6-inch "swan-neck" hoe, an 8-inch Dutch hoe, a 15-inch garden rake, a pair of 9-inch pruning shears, a pick (essential if the ground is hard or stony), and, for handling thorny plants like roses, a pair of garden gloves are desirable, though not absolutely necessary. A 2-gallon watering can and a garden wheelbarrow will be found very handy.

It is advisable to carry out any new work after the autumn rains have fallen, for the ground is then softer to dig and can be put into more workable condition. Preparation at this period leaves ample time for getting the soil in readiness for the winter planting of deciduous plants.

It is generally recognised that deep cultivation is desirable when preparing ground for planting, and I have found double digging quite a success. With this method the spade is used to dig out the first layer of soil, and the hard bottom is then broken up with the pick. On no account should any of the lower soil be brought to the surface.

After this preliminary work it is a good plan to give the land a light dressing with lime, which should be put on in sufficient quantity to whiten the surface, and raked in. The land should be left in this condition for about a month.

Deciduous plants (those that lose their leaves) are best handled in the winter as they then become established before they start to grow. Evergreens are best handled in the early spring.

Roses are without doubt the most popular of all our flowers, being easily grown and hardy. Planted 4 to 6 feet apart and with fair treatment the plants will meet when grown. New roses are very greedy feeders, and it is advisable to put a handful of blood and bone and work it well into the soil in each hole when planting. A good heavy dressing of well-rotted cow manure at any time later does not go amiss.

Before placing the plant in the ground cut off all broken roots cleanly above the break, and cut the head back hard. Plant very firmly in the ground, treading in well when doing so, and water well.

Pruning is best carried out with non-climbing roses in the winter months; climbers are best cut after flowering. The removal of undesirable growths and spindly shoots, which enables the plants to put their energies into the production of flowers, can be carried out at any time.

Carnations are grown from cuttings. New growth 4 to 6 inches is selected, broken off, the few leaves at the base of the stalk removed, and the cutting planted firmly in moist sand, kept damp by occasional waterings. When the cuttings send up

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* From a paper read before the December meeting of Moorland Branch of the New South Wales Agricultural Bureau.

their first shoots it is a good plan to draw the centre carefully out of the shoot, as this checks growth and encourages the plant to send out a number of side shoots.

Daffodils are hardy plants and easily grown provided fresh manure is kept away from them. They prefer sandy soil, though any good garden land will grow them.

Dahlias require good soil, plenty of manure and water. A small tuber with one shoot is the simplest way to start a vigorous plant, which should be confined to one stem and tied to a strong stake every foot or so. December is the correct month to plant.

Chrysanthemums may also be planted in December, but good results cannot be obtained without plenty of water. Special treatment is necessary for show purposes, but quite a brilliant display of colour may be obtained by simply allowing the plant to produce all its flowers, and tying up to stakes as required.

The growing of hardy annuals, most of which require to be raised in boxes, and the judicious planting of a few tree ferns and an occasional palm lend a charm to the garden all its own.

Orchard Notes for April.

THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Farm Notes for April.

Field.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March, 1931.		April, 1931.		MOONRISE. Mar., 1931.	April, 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.48	6.22	6.5	5.47	4.2	4.51
2	5.48	6.21	6.6	5.46	5.3	5.29
3	5.49	6.19	6.6	5.45	5.47	6.4
4	5.50	6.18	6.7	5.43	6.24	6.40
5	5.51	6.17	6.7	5.42	7.0	7.19
6	5.51	6.16	6.8	5.41	7.35	8.6
7	5.52	6.15	6.8	5.40	8.11	8.58
8	5.53	6.14	6.9	5.39	8.48	9.54
9	5.53	6.13	6.9	5.38	9.29	10.51
10	5.54	6.11	6.10	5.37	10.16	11.48
11	5.54	6.10	6.10	5.36	11.8	...
						a.m.
12	5.55	6.9	6.11	5.35	...	12.44
					a.m.	
13	5.56	6.8	6.11	5.34	12.3	1.41
14	5.56	6.7	6.12	5.33	1.0	2.36
15	5.56	6.6	6.12	5.32	1.54	3.27
16	5.57	6.5	6.13	5.31	2.50	4.14
17	5.57	6.4	6.13	5.30	3.46	5.10
18	5.58	6.3	6.14	5.29	4.40	6.3
19	5.58	6.2	6.14	5.28	5.32	6.59
20	5.59	6.1	6.15	5.27	6.23	7.56
21	5.59	5.59	6.15	5.26	7.15	8.56
22	6.0	5.58	6.16	5.25	8.8	9.55
23	6.0	5.57	6.16	5.24	9.2	10.55
24	6.1	5.56	6.17	5.23	10.3	11.52
						p.m.
25	6.1	5.55	6.17	5.22	11.2	12.45
					p.m.	
26	6.2	5.54	6.18	5.21	12.1	1.33
27	6.2	5 53	6.18	5.21	1.0	2.14
28	6.3	5.52	6.19	5.20	1.58	2.50
29	6.4	5.51	6.19	5.19	2.52	3.23
30	6.4	5.50	6.20	5.18	3.38	3.57
31	6.5	5.49	...	...	4.17	...

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Phases of the Moon, Occultations, &c.

4 Mar.	☽	Full Moon	8 36 p.m.
11 „	☽	Last Quarter	3 15 p.m.
19 „	●	New Moon	5 50 p.m.
27 „	☾	First Quarter	3 4 p.m.

Perigree, 4th March, at 8.42 p.m.
Apogee, 18th March, at 8.48 a.m.

The Moon will be passing Jupiter on the 27th when at first quarter and both below the western horizon at midnight.

Mercury will rise about an hour before the Sun on the 1st, but with it and invisible on the 15th.

Venus will rise at Warwick at 2.23 a.m. on the 1st, and at 2.41 a.m. on the 15th.

Mars will rise at 4.19 p.m., and set at 2.29 a.m. on the 1st; on the 15th it will rise at 3.41 p.m. and set at 1.33 a.m.

Jupiter will rise at 2.59 p.m. and set at 1.15 a.m. on the 1st; on the 15th it will rise at 1.40 p.m. and set at 12.19 a.m.

Saturn will rise at 2.2 a.m. and set at 3.34 p.m. on the 1st; on the 15th it will rise at 1.10 a.m. and set at 2.44 p.m.

The Southern Cross will be at position IX, 30 degrees east of the south celestial pole, about 8 p.m. on the 1st and about 6 p.m. on the 31st.

3 April	○	Full Moon	6 5 a.m.
10 „	☽	Last Quarter	6 15 a.m.
18 „	●	New Moon	10 59 a.m.
25 „	☾	First Quarter	11 40 p.m.

There will be a total eclipse of the Moon before it reaches the western horizon about 6 a.m. on 3rd April. The first indication of it reaching the shadow of the Earth will be noticeable about 4.23 a.m. For an hour the Moon will be getting deeper and deeper immersed in the shadow of the Earth, and will be totally eclipsed at 5.22. It will continue to be eclipsed for nearly an hour after it has set at Brisbane, or half-an-hour at Hughenden.

The Moon will occult Sigma Scorpii about midnight on the 6th, and Antares about three hours later. As the time for each occultation depends upon the position of the observer, it will be advisable to be on the look-out perhaps an hour earlier in each case.

An interesting object for observers with telescopes or binoculars will be to look for Saturn in broad daylight on the morning of the 10th. It will be rather more than six degrees (the length of the Southern Cross) to the northward of the Moon when both are approaching the western horizon between 11 and 12 a.m.

Mercury, which was in superior conjunction with the Sun on 15th March, will be in inferior conjunction on 30th April. On the 10th it will be at its greatest elongation, 19 degrees eastward of the Sun, and above the western horizon at that height when the Sun sets.

A partial eclipse of the Sun, confined to the northern hemisphere and of no interest in Australia, will take place on the 18th.